THE

SILVA OF NORTH AMERICA

BY

CHARLES SPRAGUE SARGENT

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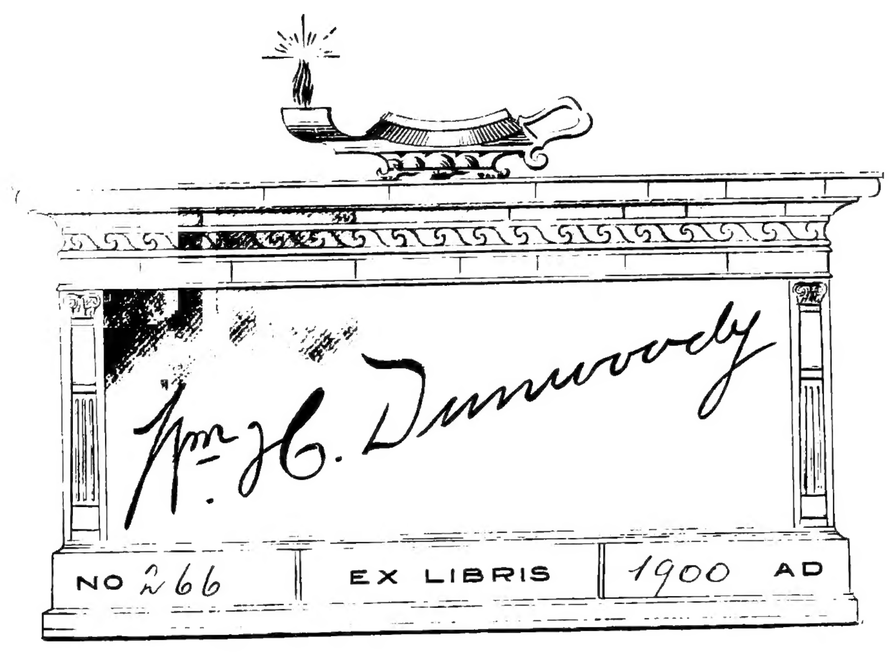

THE

SILVA OF NORTH AMERICA

A DESCRIPTION OF THE TREES WHICH GROW NATURALLY IN NORTH AMERICA EXCLUSIVE OF MEXICO

BY

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Illustrated with Figures and Analyses drawn from Nature

BY

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VOLUME II.

CYRILLACEÆ—SAPINDACEÆ

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To the Memory of

GEORGE ENGELMANN,

IN ADMIRATION OF HIS CHARACTER AND LEARNING,

THIS SECOND VOLUME OF THE

SILVA OF NORTH AMERICA

Is Dedicated

BY HIS COMPANION IN LONG JOURNEYS THROUGH THE

FORESTS OF THE WEST.

SYNOPSIS OF THE ORDERS OF PLANTS CONTAINED IN VOLUME II. OF THE SILVA OF NORTH AMERICA.

CLASS I. **DICOTYLEDONOUS or EXOGENOUS PLANTS.**

Stems increasing in diameter by the annual addition of a layer of wood inside the bark. Leaves netted-veined. Embryo with a pair of opposite cotyledons.

SUB-CLASS I. **Angiospermæ.** Pistil, a closed ovary containing the ovules and developing into the fruit.

DIVISION I. **Polypetalæ.** Flowers with calyx and corolla, the latter divided into separate petals.

B. **DISCIFLORÆ.** Sepals generally distinct. Stamens as many as the petals, or twice as many, or fewer, usually inserted on a hypogynous or perigynous disk. Ovary superior, many-celled.

** Ovules pendulous, raphe dorsal.

14. **Cyrillaceæ.** Flowers regular, perfect, 5-parted. Disk annular, confluent with the base of the ovary. Ovules solitary in each cell. Embryo minute, in fleshy albumen. Leaves alternate, exstipulate.

*** Ovules erect, or rarely pendulous, raphe ventral.

15. **Celastraceæ.** Flowers perfect. Sepals and petals imbricated in æstivation. Stamens alternate with the petals. Seeds often ariled. Leaves simple; stipules minute, caducous.

16. **Rhamnaceæ.** Sepals valvate in æstivation. Petals small, concave, or 0. Stamens opposite the petals. Seed solitary, not ariled. Embryo large, in fleshy albumen. Leaves simple, stipulate.

**** Ovules ascending, raphe ventral or dorsal.

17. **Sapindaceæ.** Flowers usually polygamo-diœcious. Disk fleshy, entire or lobed. Sepals imbricated or rarely valvate in æstivation. Petals imbricated in æstivation or 0. Stamens usually hypogynous. Seed exalbuminous or rarely albuminous. Embryo usually fleshy; cotyledons most often plano-convex, conferruminate (foliaceous in Hypelate and Acer). Leaves alternate, compound or rarely simple, exstipulate or rarely stipulate.

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SILVA OF NORTH AMERICA.

CYRILLA.

Flowers regular, perfect; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, hypogynous, contorted in æstivation; stamens 5, hypogynous; ovary 2-celled, the cells 3-ovuled. Fruit capsular, indehiscent, 2-celled, 2-seeded.

Cyrilla, Linnæus, *Mant.* 5. — A. L. de Jussieu, *Gen.* 160. — Endlicher, *Gen.* 1413. — Meisner, *Gen.* 137. — Torrey & Gray, *Fl. N. Am.* i. 256. — Planchon, *Lond. Jour. Bot.* v. 254. — Baillon, *Adansonia,* i. 203, t. 4, f. 1, 2; *Dict.* ii. 336. — Bentham & Hooker, *Gen.* ii. 1226.

A glabrous tree or shrub, with spongy bark, slender terete branchlets conspicuously marked with large leaf-scars, and narrow acuminate buds covered with chestnut-brown scales. Leaves destitute of stipules, usually clustered near the ends of the branches, alternate, entire, oblong or obovate-oblong, apiculate, rounded, or slightly emarginate at the apex, coriaceous, conspicuously reticulate-veined, short-petioled. Flowers small, in slender racemes produced near the extremities of the branches of the previous year from the axils of fallen leaves or of small deciduous bracts. Pedicels slender, from the axils of narrow alternate persistent bracts, bibracteolate near the summit. Calyx persistent, minute, divided nearly to the base into five ovate-lanceolate acute coriaceous segments. Petals white or rose-colored, inserted on an annular disk, three or four times longer than the calyx-lobes, oblong-lanceolate, acute, concave, subcoriaceous, furnished below the middle on the inner surface with a broad glandular nectary. Stamens opposite the lobes of the calyx, inserted with and shorter than the petals; filaments subulate, fleshy; anthers introrse, attached below the middle, two-celled, the cells united above the point of the attachment of the filament, free below, laterally dehiscent. Ovary free, sessile, ovoid, pointed, two-celled, the division at right angles with its short diameter; styles short, thick; stigma two-lobed, the lobes spreading; ovules suspended from an elongated placental process developed from the apex of the cell,[1] anatropous; raphe dorsal; micropyle superior. Fruit broadly ovoid, crowned with the remnants of the persistent style, two-celled, two-seeded, the pericarp spongy. Seeds suspended, elongated; testa membranaceous; albumen fleshy. Embryo minute, cylindrical, two-lobed; the radicle superior.

The wood of Cyrilla is hard, heavy, and close-grained, but destitute of strength; it contains thin conspicuous medullary rays, and is brown tinged with red, the sapwood being rather lighter colored. The specific gravity of the absolutely dry wood is 0.6784, a cubic foot weighing 43.28 pounds.

[1] Baillon (*Adansonia, l. c.; Bull. Soc. Linn.* Paris, i. 156) first pointed out the peculiar development of the ovules of Cyrilla from what he describes as "une sorte de saillie placentaire" from which they are suspended, the raphes becoming dorsal by the anatropous character the ovules assume in growth. Le Maout & Decaisne (*Trait. Gén. Bot.* 340), and after them Bentham & Hooker (*Gen. l. c.*), described the raphe as ventral in Cyrilla and in Cliftonia, in which, however, as Baillon has shown, it is really dorsal.

coast. In such situations as the last it attains a real arborescent habit and its largest size, usually growing with the Cliftonia and Yaupon, with Water Oaks and Gum-trees.

Cyrilla racemiflora was first noticed by Dr. Alexander Garden,[1] a resident of Charleston, who, in 1765, sent it to Linnæus.[2] Two years later it was, according to Aiton,[3] introduced into England by a Mr. John Cree; it flowered near Paris[4] in the garden of J. M. Cels[5] in 1786. *Cyrilla racemiflora*, although valuable as an ornamental plant on account of its handsome lustrous foliage and graceful and abundant inflorescence, has probably seldom been cultivated except in botanic gardens.[6]

of all sizes, from half an inch to a foot in diameter, spring from a common root and spread in all directions like the stalks of a tussock of sedge, interlocking and forming a dense impenetrable thicket thirty or thirty-five feet high. The leaves are often only an inch or an inch and a half long, oblanceolate, rigid, and more persistent than those on plants growing in drier soil. This variety, which is not rare in the coast region from Florida to Louisiana, was first noticed by Dr. A. W. Chapman near Apalachicola, Florida, and is mentioned in his *Flora of the Southern States*, 272.

[1] See i. 40.

[2] Smith, *Correspondence of Linnæus*, i. 319, 324.

[3] *Hort. Kew.* i. 277.

[4] Lamarck, *Dict.* ii. 245.

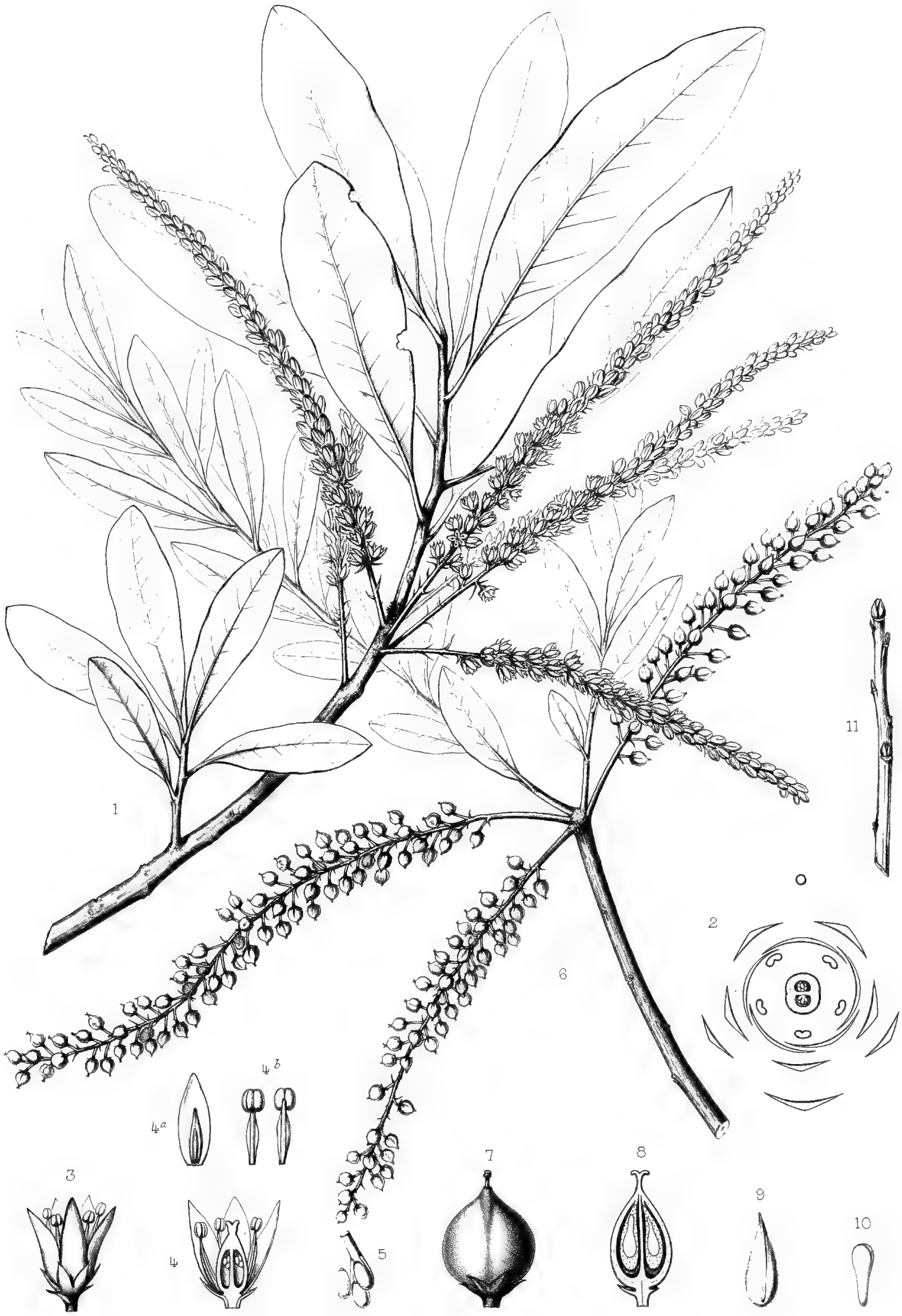
[5] Jacques Martin Cels (1743–1806) established in his nurseries at Mont Rouge, near Paris, a large collection of rare plants, including many North American trees and shrubs obtained from the Michaux. The fame of this garden is perpetuated in Ventenat's important work, *Description des Plantes Nouvelles et peu connues, cultivées dans le jardin de J. M. Cels.* It supplied also the subjects for many of the plant portraits published in the *Plantes Grasses* of De Candolle, in the *Stirpes Novæ* of L'Héritier, and in *Les Liliacées* of Rédouté. Cels was an active member of the National Council of Agriculture, and of the Academy of Natural Sciences, and contributed largely to the knowledge in France of exotic plants. A catalogue of his collections was published by his successor in 1817.

[6] According to Nuttall (*Sylva, l. c.*), *Cyrilla racemiflora* proved hardy in John Bartram's garden at Kingsessing, near Philadelphia, where in 1840 he found a specimen twenty feet high with a trunk twenty-six inches in diameter. This plant disappeared many years ago. Cyrilla flowered in the Loddiges' nursery at Hackney, near London, in 1824; and the figure in the *Botanical Magazine* was made from this plant.

EXPLANATION OF THE PLATE.

PLATE LI. CYRILLA RACEMIFLORA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
4^a. A petal, enlarged.
4^b. A stamen, front and rear view, enlarged.
5. A cluster of ovules, much magnified.
6. A fruiting branch, natural size.
7. A fruit, enlarged.
8. Vertical section of a fruit, enlarged.
9. A seed, enlarged.
10. An embryo, much magnified.
11. Winter-buds, natural size.



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CYRILLA RACEMIFLORA. L

A Riocreux dirext Imp R Taneur, Paris

CLIFTONIA.

FLOWERS regular, perfect; calyx 5 to 8-lobed, the lobes imbricated in æstivation; petals 5 to 8, hypogynous, imbricated; stamens 10, hypogynous; ovary 2 to 4-celled; ovules solitary. Fruit capsular, indehiscent, 2 to 4-winged, 2 to 4-seeded.

Cliftonia, Gærtner f. *Fruct.* iii. 246, t. 225. — Endlicher, *Gen.* 1413. — Meisner, *Gen.* 247. — Torrey & Gray, *Fl. N. Am.* i. 256. — Planchon, *Lond. Jour. Bot.* v. 254. — Baillon, *Adansonia*, i. 202, t. 4, f. 3–6; *Dict.* ii. 97. — Bentham & Hooker, *Gen.* ii. 1226.
Mylocaryum, Willdenow, *Enum.* 454.

A glabrous tree or shrub, with thick dark brown scaly bark, slender terete branchlets marked with conspicuous leaf-scars, and small acuminate buds covered with chestnut-brown scales. Leaves alternate, entire, coriaceous, oblong-lanceolate, rounded or slightly emarginate at the apex, glandular-punctate, short-petioled, destitute of stipules, persistent. Flowers in short terminal erect racemes. Pedicels slender, bibracteolate above the middle, produced from the axils of large acuminate membranaceous alternate bracts deciduous before the opening of the flower. Calyx-lobes equal or unequal, broadly ovate, rounded or acuminate at the apex, persistent, much shorter than the obovate unguiculate concave white or rose-colored deciduous petals. Stamens opposite the sepals and alternate with them, inserted with and shorter than the petals, two-ranked, those of the outer rank longer than those of the inner rank; filaments laterally enlarged near the middle, flattened below, subulate above; anthers attached below the middle, introrse, two-celled, the cells laterally dehiscent. Disk cup-shaped, surrounding the base of the oblong two to four-winged and two to four-celled ovary. Stigma subsessile, obscurely two to four-lobed; ovules suspended from the apex of the cells, anatropous; raphe dorsal; micropyle superior. Fruit oblong, crowned with the remnants of the persistent style, three or rarely four-celled, two to four-seeded; pericarp spongy, the wings thin and membranaceous. Seeds suspended, fusiform; testa thin. Embryo thin, surrounded by the fleshy albumen; cotyledons very short; the radicle superior.

The wood of Cliftonia is heavy, close-grained, and moderately hard, although brittle and not strong; it contains numerous thin medullary rays, and is brown tinged with red, with a thick lighter colored sapwood composed of forty or fifty layers of annual growth. The specific gravity of the absolutely dry wood is 0.6249, a cubic foot weighing 38.95 pounds. It burns with a clear bright flame, and is valued as fuel.

William Bartram[1] is the first botanist who noticed Cliftonia. He found it during the spring of 1773 in the coast region of Georgia, near the Savannah River.[2] It was mistaken by Lamarck for a species of Ptelea, and later was dedicated by Sir Joseph Banks to the memory of Dr. Francis Clifton,[3] an English physician of the last century. The genus is represented by a single species.

[1] See i. 16.

[2] *Trav.* 6, 30.

[3] Francis Clifton (d. 1736); the son of Joseph Clifton, a merchant of Great Yarmouth. Clifton entered the medical school at Leyden in 1724, graduated with honor the same year, and at once established himself in London as a physician. A friendship with Sir Hans Sloane and other men of science opened for Clifton the doors of the Royal Society, to which he was elected in 1727. He received an honorary degree of M. D. from the University of Cambridge, and was appointed physician to the Prince of Wales. Clifton left England suddenly in 1734 for Jamaica, where he died two years later. He was the author of several papers on medical subjects; and at the time of his death was engaged in writing an account of the diseases prevalent in Jamaica. (See Leslie Stephen, *Dict. National Biography*, xi. 86.)

CLIFTONIA MONOPHYLLA.

Titi. Iron Wood.

Cliftonia monophylla, Britton, *Bull. Torrey Bot. Club*, xvi. 310.

Ptelea monophylla, Lamarck, *Ill.* i. 336. — Poiret, *Lam. Dict.* v. 662.

C. **nitida**, Gærtner f. *Fruct.* iii. 247, t. 225. — Watson, *Bull. Torrey Bot. Club*, xiv. 167.

C. **ligustrina**, Sprengel, *Syst.* ii. 316. — Nuttall, *Gen.* i. 104; *Sylva*, ii. 92, t. 73. — Walpers, *Rep.* vi. 422. — Dietrich, *Syn.* ii. 1412. — Schnizlein, *Icon.* t. 240, f. 5, 7–10, 20. — Chapman, *Fl.* 273. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 38.

Mylocaryum ligustrinum, Willdenow, *Enum.* 454. — *Bot. Mag.* t. 1625. — Pursh, *Fl. Am. Sept.* i. 402, t. 14. — Poiret, *Lam. Dict.* Suppl. iv. 41; *Ill.* iii. 616, t. 952. — Elliott, *Sk.* i. 508.

Waltheria Carolinensis, *Cat. Hort. Fraser.*

The Cliftonia sometimes grows, under favorable conditions, to a height of forty or fifty feet, with a stout trunk which is crooked or often inclining, occasionally fifteen to eighteen inches in diameter, and covered near the base with deeply furrowed dark red-brown bark a quarter of an inch thick, the ridges broken into short broad scales. The bark of younger trunks and of the principal branches is thin, the surface separating into small persistent scales an inch or two long. The trunk generally divides, twelve or fifteen feet from the ground, into a number of stout ascending branches; or sometimes, especially in the region bordering the Atlantic Ocean, where the Cliftonia rarely assumes the habit of a tree, the stem divides at the ground into numerous straggling stout or slender branches, growing sometimes a few feet high, or often to a height of thirty or forty feet. The shoots of the year are slender, rigid, and covered with bright red-brown bark, which gradually becomes paler during the second and third seasons. The leaves are one and a half to two inches long, half an inch to nearly an inch broad, bright and lustrous on the upper, and paler on the lower surface. They remain on the branches until the autumn of their second year. The inflorescence appears in February and March. The racemes are at first nodding, and at this period are conspicuous from the presence of the long exserted dark red-brown bracts. These fall, and the racemes gradually assume an erect position before the fragrant flowers open. The fruit,[1] which is a quarter of an inch long, or rather less, ripens in August and September.

The Cliftonia is found in the coast region of the south Atlantic states from the valley of the Savannah River in South Carolina to northern Florida, extending westward through the Pine belt of the Gulf coast to eastern Louisiana. It grows generally on damp sour sandy peat-soil, and attains its greatest size in the tree-covered swamps which border the large streams of the Pine barrens of western Florida and of Alabama and Mississippi. In these swamps, which are submerged for several months of the year, it grows with the Red Bay and White Cedar under the shade of Water Oaks, Gum-trees, and the Cuban Pine, forming impenetrable thickets sometimes miles in extent. The Cliftonia in such situations is a short-lived tree. The large trunks, which are generally hollow, are easily prostrated, and specimens which have grown for more than fifty or sixty years are not common. In open shallow swamps which are seldom overflowed except temporarily the Cliftonia usually assumes a shrubby habit, forming thickets with the Wax Myrtle, the Swamp Bay, *Andromeda nitida*, *Leucothoë axillaris*, and *Vaccinium virgatum*, and near the Gulf coast with *Ilex coriacea*.

The Cliftonia is one of the most ornamental of the small trees of the North American forests, especially in the early spring, when it is covered with delicate fragrant flowers made conspicuous by their background of dark green lustrous foliage. It was probably introduced into English gardens by John

[1] The fruit, from its fancied resemblance to that of the Buckwheat, has caused the Cliftonia to be sometimes called the Buckwheat-tree; a name, however, which is possibly not in colloquial use in any part of the country where the tree is found.

Fraser[1] at the time of one of his last voyages to America, and flowered in 1812 or 1813 in his nursery at Sloane Square in London.[2] Cliftonia is now cultivated in a few botanic gardens only.[3]

[1] See i. 8.

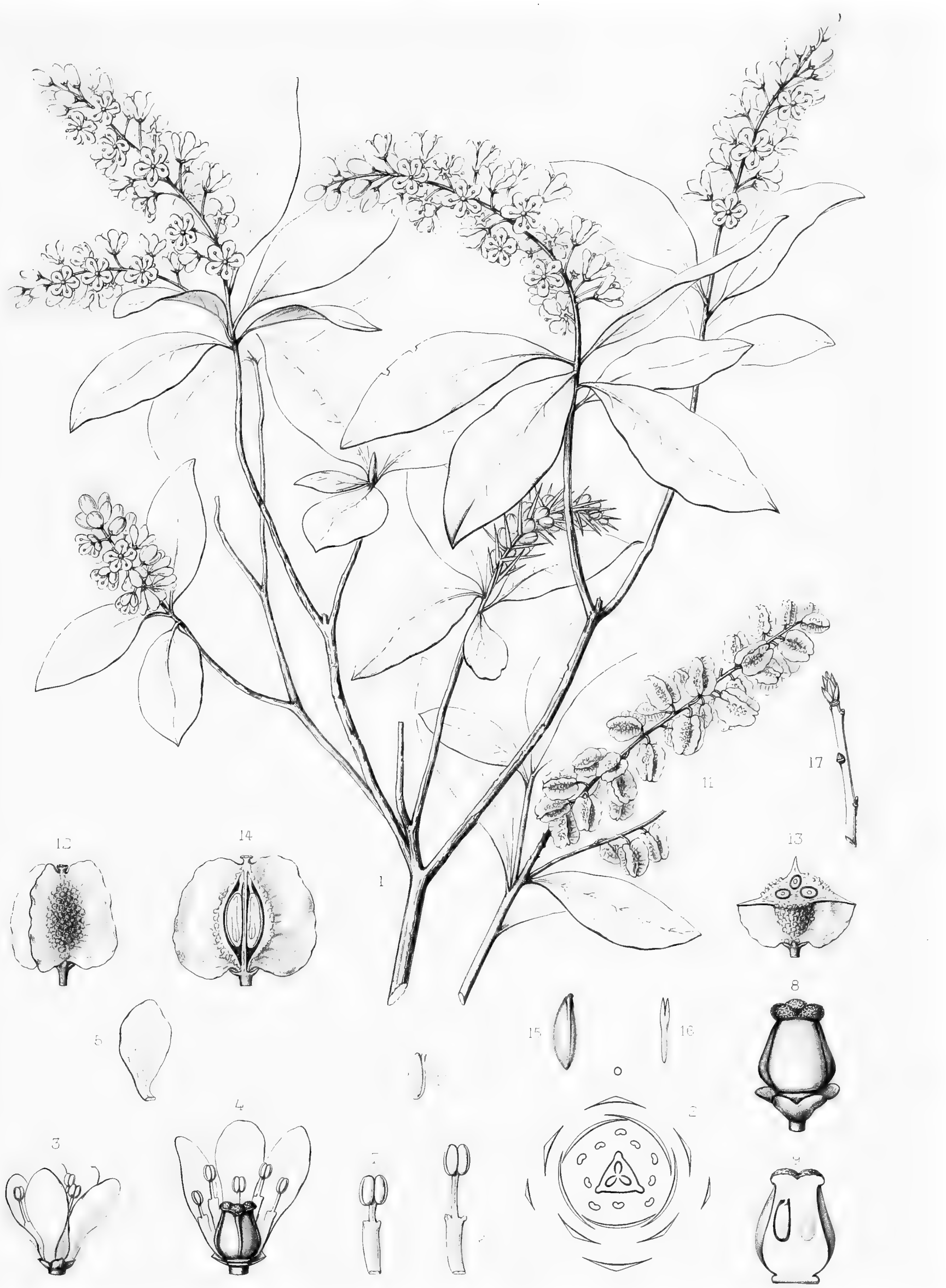
[2] The figure in the *Botanical Magazine*, published in 1813, was made from a specimen grown in Mr. Fraser's nursery.

[3] According to Nuttall (*Sylva*, ii. 94), Cliftonia survived for a number of years without protection in Bartram's botanic garden at Kingsessing, near Philadelphia.

EXPLANATION OF THE PLATE.

PLATE LII. CLIFTONIA MONOPHYLLA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, enlarged, two of the petals removed.
5. A petal, enlarged.
6. A stamen of the outer rank, enlarged.
7. A stamen of the inner rank, enlarged.
8. A pistil, enlarged.
9. Vertical section of a pistil, enlarged.
10. An ovule, much magnified.
11. A fruiting branch, natural size.
12. A fruit, enlarged.
13. Cross section of a fruit, enlarged.
14. Vertical section of a fruit, enlarged.
15. A seed, enlarged.
16. An embryo, much magnified.
17. Winter-buds, natural size.



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CLIFTONIA MONOPHYLLA, Britt

A Riocreux direx.t

Imp.R. Taneur Paris

EVONYMUS.

FLOWERS perfect or polygamo-triœcious; calyx 4 to 5-lobed, the lobes imbricated in æstivation; petals 4 or 5, inserted under the margin of the disk, imbricated in æstivation; ovary 3 to 5-celled; ovules usually 2 in each cell, ascending or resupinate. Fruit capsular, 3 to 5-celled; seeds surrounded by a colored aril.

Evonymus, Linnæus, *Gen.* 29. — Adanson, *Fam. Pl.* ii. 304. — A. L. de Jussieu, *Gen.* 377. — Endlicher, *Gen.* 1086. — Meisner, *Gen.* 68. — Gray, *Gen. Ill.* ii. 187. — Bentham & Hooker, *Gen.* i. 360, 997. — Baillon, *Hist. Pl.* vi. 30.

Vyenomus, Presl, *Bot. Bemerk.* 32.

Melanocarya, Turczaninow, *Bull. Mosc.* xxxi., i. 453.

Small trees or shrubs, generally glabrous, sometimes trailing or climbing, with fibrous roots, usually square, sometimes terete, often verrucose branchlets, bitter drastic bark, and slender obtuse or acuminate buds. Leaves opposite, petiolate, entire, crenate or dentate, deciduous or persistent; stipules minute, caducous. Flowers in dichotomous axillary cymes, usually few-flowered, rarely one-flowered. Calyx-lobes spreading or recurved. Disk thick and fleshy, cohering with and filling the short tube of the calyx, flat, four or five-angled or lobed, closely surrounding and adherent to the ovary. Petals inserted in the sinuses of the calyx under the free border of the disk, spreading, entire, dentate or rarely fimbriate, much longer than the calyx-lobes, greenish white or purple, deciduous. Stamens as many as the petals and alternate with them, inserted on the summit or rarely on the margin of the disk; filaments very short, subulate, erect or recurved at the apex; anthers didymous, introrse, two-celled, the cells nearly parallel or spreading below, opening longitudinally. Ovary immersed in and confluent with the disk; style very short, terminating in a depressed or three to five-lobed stigma; ovules usually two in each cell, rarely four or more, anatropous, ascending from the central angle, the raphe ventral, the micropyle inferior; or pendulous, the raphe then dorsal, the micropyle superior. Fruit fleshy, three to five-lobed, angled or winged, smooth, verrucose or echinate, loculicidally three to five-valved, the valves septiferous on their middle. Seeds two, or more commonly by abortion solitary in each cell, ascending, or resupinate and suspended; aril red or purple; testa chartaceous; albumen fleshy. Embryo axile; cotyledons broad, coriaceous, parallel with the raphe; the radicle short, inferior or superior.[1]

The genus Evonymus is widely distributed through the northern hemisphere, extending south of the equator to the islands of the Indian Archipelago and to Australia. Botanists now distinguish about forty species, the largest number occurring in the tropical regions of southern Asia,[2] in China[3] and in Japan.[4] Several species are found as far south as the mountains of Ceylon;[5] one of the Indian species occurs also in Sumatra and in Java,[6] and one species has been detected in northeastern

[1] The flowers of *Evonymus Europœus* were found by Darwin (*Different Forms of Flowers on Plants of the Same Species*, 287) to be of three forms, one with perfectly developed stamens and pistils, one with semi-sterile hermaphrodite flowers, and a third with perfect pistils and rudimentary anthers. The flowers of the North American species, so far as I have been able to observe them, are perfect.

[2] Hooker f. *Fl. Brit. Ind.* i. 607.

[3] Bentham, *Fl. Hongk.* 62. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 118.

[4] Franchet & Savatier, *Enum. Pl. Jap.* i. 78. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvii. 241 (Mél. Biol. xi. 177).

[5] Thwaites, *Enum. Pl. Zeylan.* 73.

[6] *Evonymus Javanicus*, Blume, *Bijdr. Fl. Ned. Ind.* 1146. — Bennett, *Pl. Jav. Rar.* 130, t. 28. — Miquel, *Fl. Ind. Bat.* i., ii. 588.

Australia.[1] The genus is represented in central Asia,[2] and is widely scattered, with a number of species, through the Orient,[3] and through temperate and southern Europe.[4] In North America two species occur in the Atlantic[5] and one in the Pacific[6] region, and three or four little known species inhabit southern Mexico.[7] One of the Atlantic species is a small tree; the other American species are shrubs.

The wood of Evonymus is moderately hard, close-grained, tough, and light-colored, sometimes nearly white. It has been used in Europe from the earliest ages for many domestic purposes. Knitting-needles and spindles[8] were long made from it, and it was once used in the manufacture of musical instruments and in cooperage;[9] in India it is sometimes carved into spoons and other household utensils,[10] and in China it is used in wood-engraving.[11]

Many species of Evonymus are rich in bitter and astringent principles, and are drastic and slightly stimulant. The bark and especially the seeds of the European species[12] are nauseous and purgative, and are believed to poison sheep,[13] while in India the leaves and young shoots of some of the species are cut for fodder.[14] The yellow dye used by the Hindoos to make the sacred mark on the forehead is prepared from the bark[15] of *Evonymus tingens*,[16] which is also employed in the treatment of ophthalmic troubles. The bark[17] of the American species is purgative and is employed in the preparation of decoctions, fluid extracts and tinctures,[18] and in homœopathic remedies.

Several species of Evonymus are valued in gardens for their handsome foliage and brilliant fruit. The European species have been cultivated for centuries, and have developed numerous peculiar and interesting forms.[19] *Evonymus Japonicus* is one of the most ornamental of evergreen shrubs, and, with its numerous varieties, is common in the gardens of all the temperate parts of the world. A variety of this plant from the forests of central and northern Japan, the *Evonymus radicans*[20] of gardens, with high climbing stems and small persistent leaves, has been largely cultivated in recent years, and replaces the Ivy in regions where the climate is too severe for that plant.

Εὐώνυμος, the classical name of the Spindle-tree,[21] was adopted by Tournefort,[22] and then by Linnæus.

[1] *Evonymus Australianus*, Mueller, *Fragm. Phyt. Austral.* iv. 118.

[2] Aitchison, *Jour. Linn. Soc.* xviii. 40.

[3] Boissier, *Fl. Orient.* ii. 8.

[4] Nyman, *Conspect. Fl. Europ.* 144.

[5] Trelease, *Trans. St. Louis Acad.* v. 351. — Watson & Coulter, *Gray's Man.* ed. 6, 110.

[6] Brewer & Watson, *Bot. Cal.* i. 98.

[7] Bentham, *Pl. Hartweg.* 36, 59. — Hemsley, *Bot. Biol. Am. Cent.* i. 188.

[8] Loudon, *Arb. Brit.* ii. 496.

[9] The vernacular name Spindle-tree, first applied to the European species on account of its use in spindle-making, has been gradually transferred to the other species in all English-speaking countries.

[10] Brandis, *Forest Fl. Brit. Ind.* 78.

[11] Jackson, *Commercial Botany*, 156.

[12] *Evonymus Europæus*, Linnæus, *Spec.* 197. — De Candolle, *Prodr.* ii. 4. *E. latifolius*, Scopoli, *Fl. Carn.* 325. — De Candolle, *l. c.* *E. verrucosus*, Scopoli, *Fl. Carn.* 324. — De Candolle, *l. c.*

[13] Le Maout & Decaisne, *Trait. Gén. Bot.* English ed. 344.

[14] Brandis, *l. c.*

[15] Le Maout & Decaisne, *l. c.*

[16] Wallich; Roxburgh, *Fl. Ind.* ed. Carey, ii. 406. — Brandis, *l. c.* 79. — Hooker f. *Fl. Brit. Ind.* i. 615.

[17] Euonic acid was obtained by Wenzel (*Am. Jour. Pharm.* 1862, 312) from the bark of *Evonymus atropurpureus*. It crystallizes in acicular forms, and is precipitated by plumbic subacetate. Resin, sugar, a bitter principle, asparagine, and tartaric, citric, and nitric acids have also been found in the bark of this species. (Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 42, t. 42.)

[18] *Am. Jour. Pharm.* xx. 80. — *U. S. Dispens.* ed. 14, 402. — Stillé & Maisch, *Nat. Dispens.* ed. 2, 559.

[19] Loudon, *Arb. Brit.* ii. 496.

[20] *Evonymus Japonicus*, var. *radicans*, Miquel, *Prol. Fl. Jap.* 18. — Maximowicz, *Bull. Aad. Sci. St. Pétersbourg*, xxvii. 441 (Mél. Biol. xi. 178).

E. radicans, Siebold in *herb.*; Miquel, *l. c.* 366. — Franchet & Savatier, *Enum. Pl. Jap.* i. 79.

[21] Pliny, xiii. 22.

[22] *Inst.* 617, t. 388.

EVONYMUS ATROPURPUREUS.

Burning Bush. Wahoo.

PARTS of the flower usually in 4's; ovules ascending, the raphe ventral. Fruit smooth, deeply lobed.

Evonymus atropurpureus, Jacquin, *Hort. Vind.* ii. 55, t. 120. — Lamarck, *Dict.* ii. 573; *Ill.* ii. 98. — Schmidt, *Oestr. Baum.* ii. 20, t. 73. — Willdenow, *Spec.* i. 1132; *Enum.* 256. — Michaux, *Fl. Bor.-Am.* i. 155. — Persoon, *Syn.* i. 243. — *Nouveau Duhamel*, iii. 26. — Desfontaines, *Hist. Arb.* ii. 356. — Pursh, *Fl. Am. Sept.* i. 168. — Turpin, *Dict. Sci. Nat.* xvii. 532, t. 272. — Nuttall, *Gen.* 155. — Roemer & Schultes, *Syst.* v. 466. — Hayne, *Dendr. Fl.* 24. — Elliott, *Sk.* i. 293. — De Candolle, *Prodr.* ii. 4. — Torrey, *Fl. N. Y.* i. 141. — Sprengel, *Syst.* i. 788. — Don, *Gen. Syst.* ii. 5. — Spach, *Hist. Veg.* ii. 407. — Loudon, *Arb. Brit.* ii. 499, f. 167. — Torrey & Gray, *Fl. N. Am.* i. 257. — Dietrich, *Syn.* i. 819. — Griffith, *Med. Bot.* 219, f. 112. — Darlington, *Fl. Cestr.* ed. 3, 48. — Baillon, *Bull. Soc. Bot. France*, v. 256, 314. — Chapman, *Fl.* 76. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 102. — Koch, *Dendr.* i. 629. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 38. — Trelease, *Trans. St. Louis Acad.* v. 353. — Watson & Coulter, *Gray's Man.* ed. 6, 110.

E. Carolinensis, Marshall, *Arbust. Am.* 43.

E. latifolius, Marshall, *Arbust. Am.* 44 (not Scopoli). — Agardh, *Theor. et Syst. Pl.* t. 22, f. 4.

A small slender tree, growing rarely to a height of twenty or twenty-five feet, with spreading branches; or more often a shrub six to ten feet high. The trunk, which does not often attain a greater diameter than six or seven inches, is covered with thin ashy gray fluted bark, the surface separating into minute scales. The branchlets are terete, slender, and marked with prominent leaf-scars which are white during the first winter; they are covered with dark purple-brown bark, which becomes lighter colored in the second season, and which is often beset with small crowded lenticels. The winter-buds are an eighth of an inch long, acute and protected by narrow purple apiculate scales with scarious margins and covered with a glaucous bloom. The leaves are elliptical or ovate, acuminate, minutely serrate or biserrate, membranaceous, puberulous on the lower surface, two to five inches long and one to two inches broad; they are gradually contracted at the base into stout petioles half an inch to nearly an inch long, and are furnished with stout midribs and primary veins. They turn pale yellow in the autumn and fall in October. The twice or thrice dichotomous cymes are usually seven to fifteen-flowered, and are produced on slender peduncles an inch or two long, and conspicuously marked with the scars of minute bracts. The flowers appear in May, or, at the north, about the middle of June; they are nearly half an inch across, when expanded, with rounded or rarely acute and mostly entire sepals, and with broadly obovate undulate dark purple petals often with erose margins. The fruit, which ripens in October and remains on the branches during the early months of winter, is smooth, deeply lobed, half an inch across, or rather more, with light purple valves. The seeds are somewhat gibbous on the dorsal side, broad and rounded above, and narrowed at the end next the hilum; they are a quarter of an inch long, with a thin light chestnut-brown wrinkled testa, and are included in a thin scarlet aril.

Evonymus atropurpureus is widely distributed in eastern America from western New York to Nebraska, with an extreme western station in the valley of the upper Missouri River in Montana, and extends south to northern Florida, southern Arkansas, and the Indian Territory. It generally grows along the borders of woods in rich soil, rarely assuming, east of the Mississippi River, the habit of a tree, and being really arborescent in southern Arkansas and the adjacent regions only.

The wood of *Evonymus atropurpureus* is heavy, hard, very close-grained, and difficult to season; it is white tinged with orange, with thin inconspicuous medullary rays. It has, when perfectly dry, a specific gravity of 0.6592, a cubic foot weighing 41.08 pounds.

The Wahoo, as this plant is familiarly called,[1] is said to have been introduced into English gardens as early as 1756,[2] and it is still often cultivated, especially in the region where it abounds, although its fruit and the autumn coloring of its leaves are less beautiful than those of some of the Old World Spindle-trees.

Few insects are recorded as living on Evonymus in America,[3] although the different species are occasionally disfigured by them.

[1] *Evonymus atropurpureus* is also known in some parts of the country as Spindle-tree and as Arrow-wood.

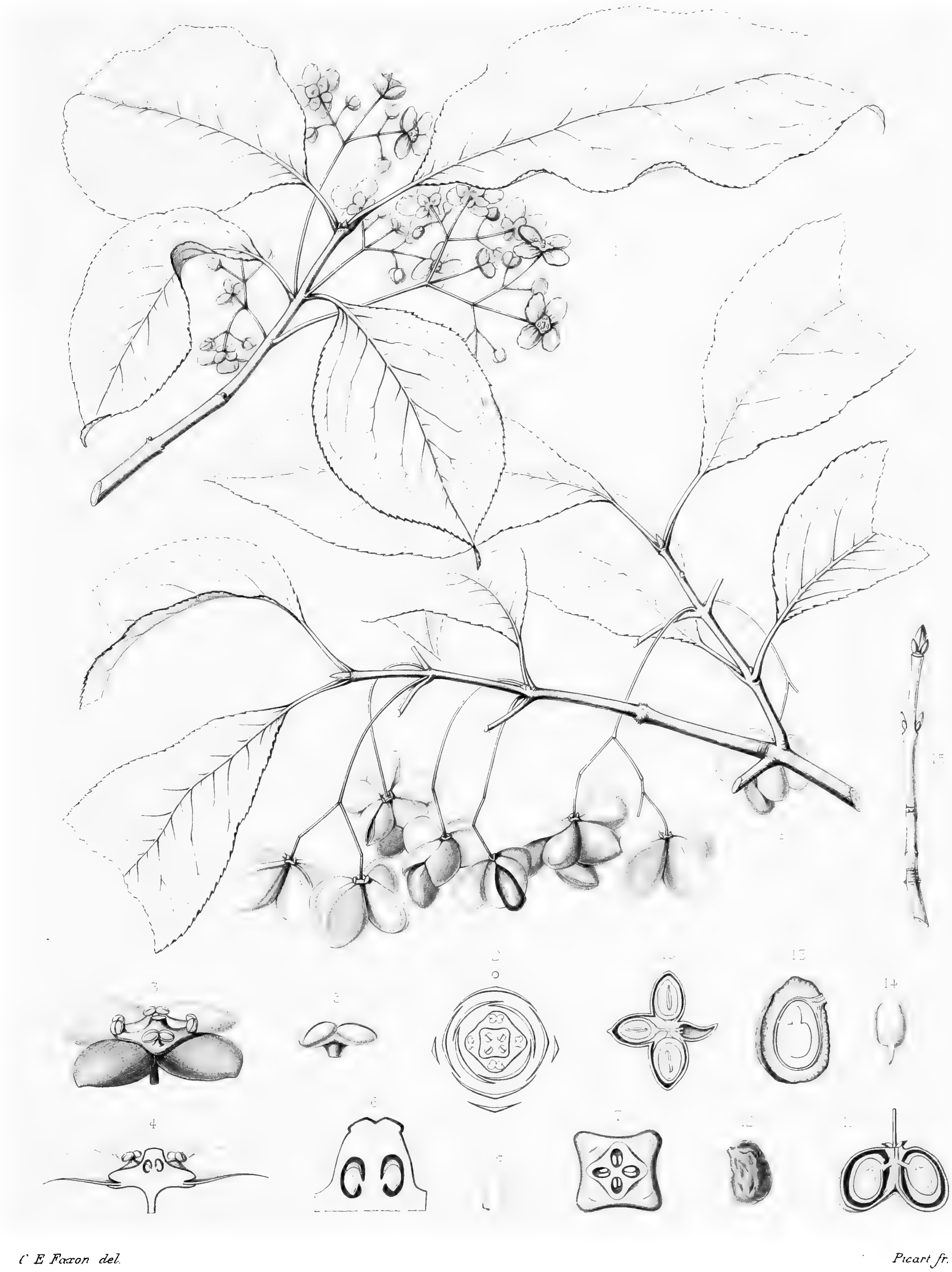
[2] Aiton, *Hort. Kew.* i. 274.

[3] The larva of a small moth, *Hyponomeuta euonymella*, Schop., feeds on the leaves of *Evonymus atropurpureus* in Kentucky (V. T. Chambers, *Canadian Entomologist*, iv. 42. — *Bull. Hayden's U. S. Geolog. Surv.* iv. 110). The Fall Web-worm, *Hyphantria cunea*, Drury, sometimes destroys the foliage (*Bull.* No. 10, *Div. Entomol. Dept. Agric. U. S.* 41); and the bark and branches are frequently covered by a scale, Lecanium. The leaves are often infested by aphids.

EXPLANATION OF THE PLATE.

PLATE LIII. EVONYMUS ATROPURPUREUS.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, front view, enlarged.
6. Vertical section of a pistil, enlarged.
7. Cross section of an ovary surrounded by the disk, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Cross section of a fruit, natural size.
11. Vertical section of a fruit, natural size.
12. A seed surrounded by its aril, slightly enlarged.
13. Vertical section of a seed, enlarged.
14. An embryo, much magnified.
15. Winter-buds.



C. E. Faxon del. Picart fr. sc.

EVONYMUS ATROPURPUREUS, Jacq.

A. Riocreux direx.t Imp. R. Taneur, Paris

GYMINDA.

FLOWERS unisexual; calyx 4-lobed, the lobes imbricated in æstivation; petals 4, imbricated in æstivation; ovary 2-celled; ovules solitary, suspended. Fruit drupaceous, 2-celled, 1 to 2-seeded.

Gyminda, Sargent, *Garden and Forest*, iv. 4. **Myginda** (sec. *Gyminda*), Grisebach, *Cat. Pl. Cub.* 55.

A slender tree or shrub, with pale quadrangular branchlets and minute acuminate buds. Leaves opposite, short-petioled, oblong-obovate, rounded and sometimes emarginate at the apex, entire or remotely crenulate-serrate above the middle, with revolute thickened margins, feather-veined, coriaceous, persistent; stipules minute, acuminate, membranaceous, caducous. Flowers pedicellate, in axillary pedunculate few-flowered dichotomously branched cymes, furnished immediately below the calyx with two minute bracts. Calyx minute, persistent, with a short urceolate tube and rounded lobes. Disk fleshy, filling the tube of the calyx, cup-shaped, slightly four-lobed. Petals entire, obovate, rounded at the apex, reflexed, much longer than the lobes of the calyx, white. Stamens four, opposite the sepals, inserted in the lobes of the disk, exserted; wanting in the fertile flower; filaments slender, subulate, incurved; anthers attached below the middle, oblong, two-celled, the contiguous cells opening longitudinally. Ovary oblong, sessile, confluent with the disk, two-celled, crowned with the large two-lobed sessile stigma; rudimentary, deeply cleft in the sterile flower; ovules suspended from the apex of the cell, anatropous; raphe dorsal; micropyle superior. Fruit black or dark blue, oval or obovate, the size of a pea, crowned with the remnants of the persistent stigma, often one-celled by abortion; sarcocarp rather thin; putamen thick, crustaceous. Seed oblong, suspended; testa membranaceous; albumen thin, fleshy. Embryo axile; cotyledons ovate, foliaceous; radicle superior, next the hilum.

The wood of Gyminda is very heavy, hard, and close-grained, the layers of annual growth and numerous medullary rays being barely distinguishable. It is dark brown or nearly black, with thick light brown sapwood composed of seventy-five or eighty layers of annual growth. The specific gravity of the absolutely dry wood is 0.9048, a cubic foot weighing 56.39 pounds.[1]

The generic name, first used by Grisebach[2] for a section of Myginda, is formed by transposing the first three letters of that name. One species is known.

[1] The wood of this tree is produced very slowly. A specimen in the Jesup Collection of North American Woods in the American Museum of Natural History in New York is three and a half inches in diameter, and contains one hundred layers of annual growth.

[2] Heinrich Rudolph August Grisebach (1814–1879) was born in Hannover and died in Göttingen, where he was professor of botany in the University. Grisebach published in 1839 a monograph of the Gentian family, and two years later an account of the plants collected by him during a botanical journey through Roumelia. In 1864 appeared his *Flora of the British West Indies*, one of a series of colonial Floras prepared under the auspices of the British government; and in 1866 his *Catalogus Plantarum Cubensium*, an account of the collections made by Charles Wright in that island. The most important of Grisebach's contributions to science relate to botanical geography, a subject to which he gave particular attention and upon which he wrote voluminously. His *Vegetation der Erde*, published in 1872, is one of the classical books on the subject, and the author's crowning scientific effort. *Grisebachia*, a genus of heath-like plants native of south Africa, was dedicated to him by Klotzsch.

GYMINDA GRISEBACHII.

Gyminda Grisebachii, Sargent, *Garden and Forest*, iv. 4.

Myginda integrifolia, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vii. 66 (not Lamarck, *Dict.* iv. 396). — De Candolle, *Prodr.* ii. 13. — Grisebach, *Cat. Pl. Cub.* 55. — Sargent, *Bot. Gazette*, xi. 314. — Trelease, *Trans. St. Louis Acad.* v. 356.

Myginda pallens, Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 38 (not Smith).

Myginda latifolia, Chapman, *Fl.* 76 (not Swartz). — Trelease, *Trans. St. Louis Acad.* v. 356.

A tree, growing sometimes to a height of twenty or twenty-five feet, with a trunk rarely more than six inches in diameter covered with thin brown bark tinged with red, the surface separating into thin minute scales. The branchlets become terete during their third season, and are then covered with thin slightly grooved and roughened light red-brown bark. The leaves are an inch and a half to two inches long, three quarters of an inch to an inch broad, and pale yellow-green. The flowers, which are produced on the shoots of the year, appear in Florida from April to June. The fruit ripens in November.

Gyminda Grisebachii is common and generally distributed through the islands of south Florida from the Marquesas to Upper Metacombe Key. It also inhabits Cuba and Porto Rico.[1] A form[2] of this plant with smaller, less coriaceous, very glaucous leaves was found in Cuba[3] by Charles Wright.[4]

Gyminda Grisebachii was discovered in Florida by Dr. John L. Blodgett.[5]

[1] P. Sintenis, *Plantæ Portoricenses*, No. 532.

[2] *Gyminda Grisebachii*, var. *glaucescens*, Sargent, *Garden and Forest*, iv. 4.

Myginda latifolia, var. *glaucescens*, Grisebach, *Mem. Am. Acad.* viii. 171; *Cat. Pl. Cub.* 55.

[3] *Pl. Cub.* No. 81*a*.

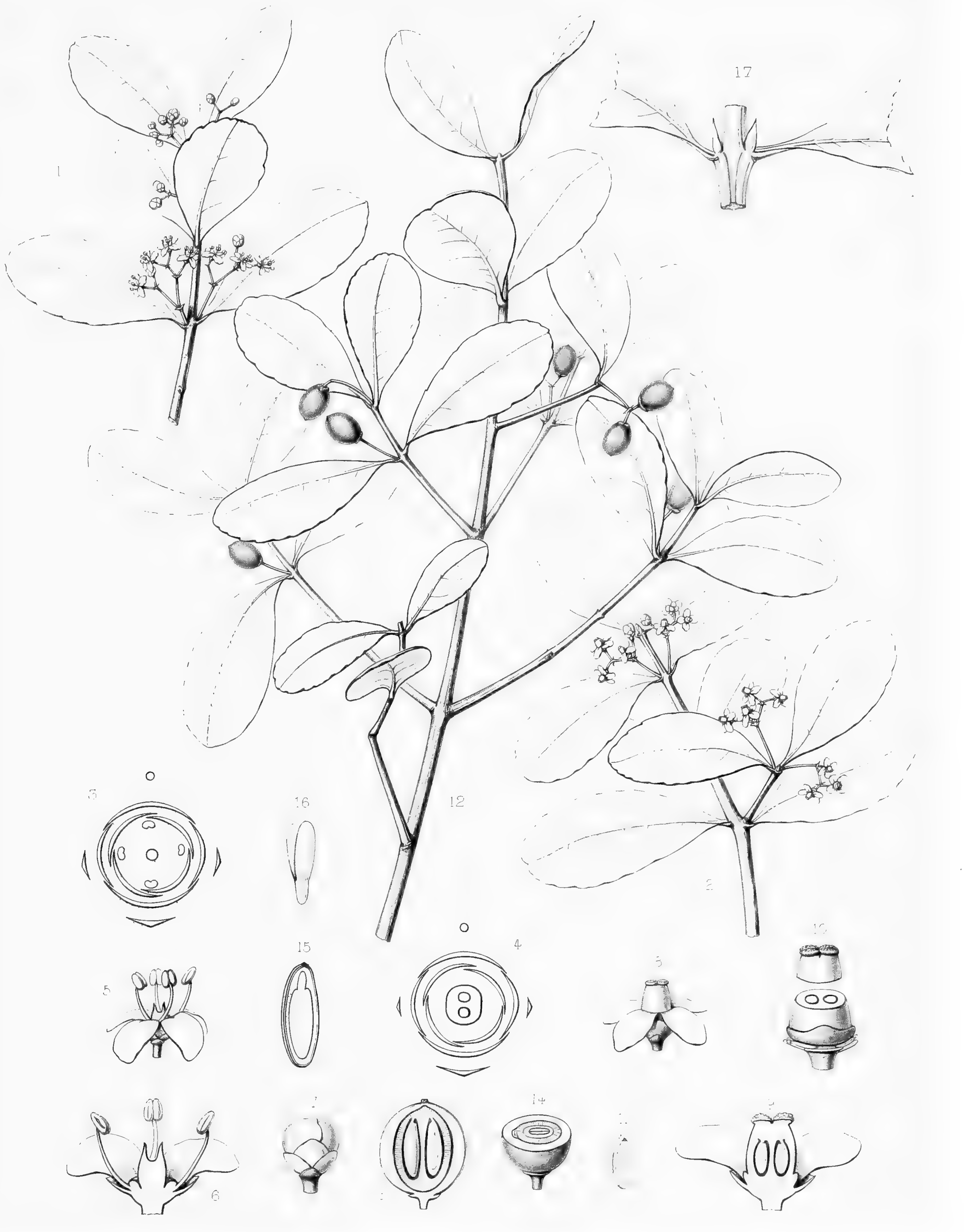
[4] See i. 94.

[5] See i. 33.

EXPLANATION OF THE PLATE.

PLATE LIV. GYMINDA GRISEBACHII.

1. A flowering branch of a staminate plant, natural size.
2. A flowering branch of a pistillate plant, natural size.
3. Diagram of a staminate flower.
4. Diagram of a pistillate flower.
5. A staminate flower, enlarged.
6. Vertical section of a staminate flower, enlarged.
7. A flower-bud, enlarged.
8. A pistillate flower, enlarged.
9. Vertical section of a pistillate flower, enlarged.
10. Cross section of a pistil, enlarged.
11. An ovule, much magnified.
12. A fruiting branch, natural size.
13. Vertical section of a fruit, enlarged.
14. Cross-section of a fruit, enlarged.
15. Vertical section of a seed, enlarged.
16. An embryo, much magnified.
17. Stipules, enlarged.



C E Faxon del

Picart fr. sc

GYMINDA GRISEBACHII, Sarg.

A. Riocreux direx.t

Imp R Taneur. Paris

SCHÆFFERIA.

FLOWERS unisexual; calyx 4-parted, the lobes imbricated in æstivation; petals 4, imbricated in æstivation, hypogynous; stamens 4, hypogynous, inserted under the margin of the disk; ovary 2-celled; ovules solitary, erect. Fruit a 2-seeded fleshy drupe.

Schæfferia, Jacquin, *Stirp. Am.* 259. — Endlicher, *Gen.* 1103. — Meisner, *Gen.* 69. — Bentham & Hooker, *Gen.* i. 367. — Baillon, *Hist. Pl.* vi. 37.

Glabrous trees or shrubs, with slender rigid terete branches and small obtuse buds. Leaves alternate, or fascicled on short spur-like branches, entire, obovate or spatulate, acute, rounded, or emarginate at the apex, destitute of stipules. Flowers diœcious, pediceled or sessile, in axillary clusters from large buds covered with scale-like persistent bracts. Calyx-lobes orbicular, persistent, much shorter than the oblong obtuse white or greenish white petals. Disk small, inconspicuous. Stamens opposite the lobes of the calyx, wanting in the fertile flower; filaments subulate, incurved; anthers attached below the middle, subglobose, introrse, two-celled, the cells opening longitudinally. Ovary two-celled, ovoid, sessile, free; rudimentary in the sterile flower; style very short; stigma large, two-lobed, the lobes spreading; ovules solitary, ascending, anatropous; the raphe thin, ventral; the micropyle inferior. Fruit the size of a pea, ovate or obovate, crowned with the remnants of the persistent style, indistinctly two-lobed by a longitudinal groove on the two sides, slightly flattened; sarcocarp thin and fleshy, tuberculate; nutlets bony, separable. Seeds solitary, ascending; testa membranaceous; albumen fleshy. Embryo axile; cotyledons broad, foliaceous; the radicle very short, inferior, next the hilum.

Two species of Schæfferia are described. The type of the genus, *Schæfferia frutescens*, a small tree or shrub, is widely distributed in the Antilles, reaching the islands of south Florida and Central America. The second species,[1] a little known shrub, belongs to the arid region of western Texas and northern Mexico.

The wood of Schæfferia is hard and close-grained; the genus is not known to possess other properties useful to man. It was established by Jacquin, and named in honor of J. C. Schaeffer,[2] a distinguished German naturalist of the last century.

[1] *Schæfferia cuneata*, Gray, *Pl. Wright.* i. 35; ii. 29 (*Smithsonian Contrib.* iii., v.). — Torrey, *Bot. Mex. Bound. Surv.* 47. — Trelease, *Trans. St. Louis Acad.* v. 356.

[2] Jakob Christian Schaeffer (1718–1790); born at Querfurt, a clergyman and superintendent at Ratisbon from 1779 until his death. Schaeffer was a writer on zoölogy, and the author of several botanical books, including the *Botanica Expeditior* and two illustrated works on the Fungi found in the neighborhood of Ratisbon.

SCHÆFFERIA FRUTESCENS.

Yellow Wood. Box Wood.

FLOWERS pediceled. Leaves alternate, usually acute at the two ends.

Schæfferia frutescens, Jacquin, *Cat. Pl. Carib.* 33; *Stirp. Am.* 259. — Gærtner f. *Fruct.* Suppl. 249, t. 225. — Poiret, *Lam. Dict.* vi. 727; *Ill.* iii. 402, t. 809. — De Candolle, *Prodr.* ii. 41. — Karsten, *Fl. Columb.* i. 183, t. 91. — Chapman, *Fl.* 76. — Grisebach, *Fl. Brit. W. Ind.* 146. — Walpers, *Ann.* vii. 581. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 39. — Trelease, *Trans. St. Louis Acad.* v. 356.

S. completa, Swartz, *Fl. Ind. Occ.* i. 327, t. 7, f. A. — Poiret, *Lam. Ill.* iii. 402. — Willdenow, *Spec.* iv. 741. — Macfadyen, *Fl. Jam.* 207.

S. buxifolia, Nuttall, *Sylva*, ii. 42, t. 56.

A small slender glabrous tree, with rigid upright terete branches, and slender many-angled branchlets, growing sometimes to the height of thirty-five or forty feet, with a trunk eight or ten inches in diameter; or often a tall or low shrub. The bark of the trunk is rarely more than a twelfth of an inch thick, pale brown faintly tinged with red, the surface divided by long shallow fissures, and separating ultimately into small narrow scales; that of the shoots of the year is pale greenish yellow, becoming light gray during the second year, and then conspicuously marked with the remains of the persistent wart-like clusters of bud-scales. The leaves are persistent, entire, obovate-oblong, usually acute, and then often minutely apiculate, or sometimes rounded or emarginate at the apex, the base narrowed gradually into a short broad petiole; they are bright yellow-green, two to two and a half inches long and half an inch to an inch broad, with thick revolute margins. In Florida they appear in April, and remain on the branches until the spring of the following year. The pedicels of the sterile flowers, generally three or five together, are rarely more than two lines long; those of the fertile flowers are solitary, or more often two or three together, and are rather longer than the petioles. The flowers are produced in spring on shoots of the year, and are an eighth of an inch across when expanded. The fruit is slightly grooved and compressed, and is bright scarlet at maturity. It ripens in Florida in November, and then possesses an acrid disagreeable flavor, but is greedily devoured by many birds.

Schæfferia frutescens is not rare in southern Florida, being found on the principal islands from Metacombe Key eastward, in the neighborhood of the Caloosa River and sparingly on the Reef Keys. It inhabits the Bahama group, is widely distributed through the West Indies, and has been noticed in Venezuela.[1] In Florida, where this tree was once much more common than it is now, it is usually found growing with the Eugenias, the Pisonias, the Florida Coccoloba, the Drypetes, the Bumelia, and the Ardisia, forming with them the shrubby second growth which now covers several of the large keys.

The wood of *Schæfferia frutescens* is heavy and close-grained; it contains numerous obscure medullary rays, and is bright clear yellow, while the thick sapwood is a little lighter colored. The specific gravity of the absolutely dry wood is 0.7745, a cubic foot weighing 48.27 pounds. It has been used as a substitute for box-wood, and the large trees were cut in Florida many years ago and sent to New Providence for export to England.

Schæfferia frutescens was first described by Plukenet[2] in 1691. He obtained it from the Barba-

[1] Near the city of Quibor, Kartsen, *l. c.*

[2] *Buxus Lauri Alexandrinæ foliis accedens Americana*, *Phyt.* t. 80, f. 6; *Alm. Bot.* 74.

does: it was discovered in Jamaica by Sloane,[1] and living plants were carried to England in 1793[2] by Admiral Bligh.[3] It was first noticed in Florida by Dr. John L. Blodgett.

[1] *Buxi folio majore acuminato arbor baccifera, fructu minore, croceo, dipyreno, Cat. Pl. Jam.* 171; *Nat. Hist. Jam.* ii. 102, t. 209, f. 1. — Ray, *Hist. Pl. Dendr.* iii. 65.

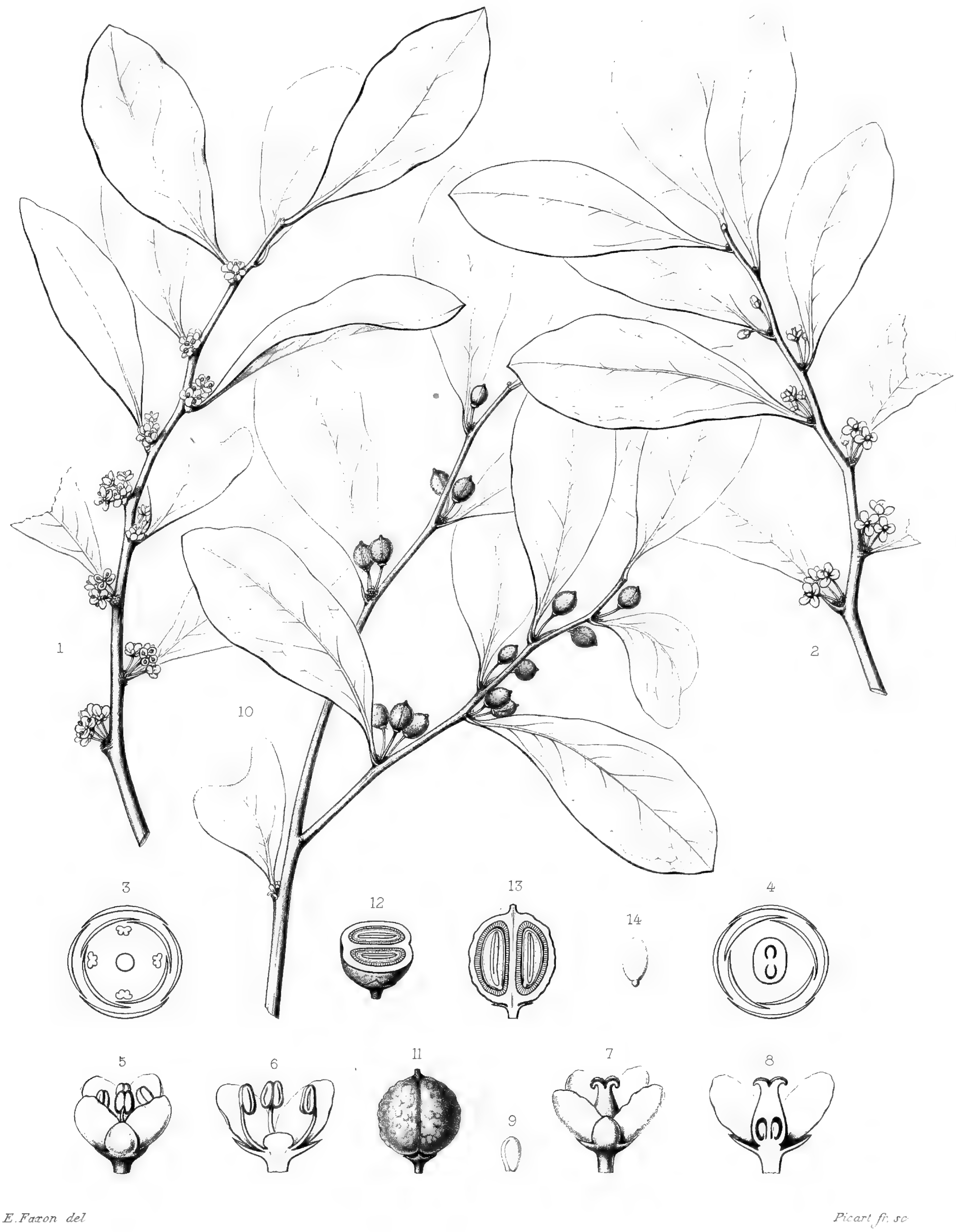
[2] Aiton, *Hort. Kew.* ed. 2, v. 371.

[3] William Bligh (1754–1817); a distinguished British naval officer who early in life accompanied Cook in his second voyage round the world as sailing-master of the Resolution. He is best known, perhaps, from his connection with the unfortunate voyage of the Bounty, a vessel sent in 1788 to the South Seas under his command to introduce the Bread-fruit tree into the West Indies. The story of the mutiny of the crew is familiar. Captain Bligh and a few companions were set adrift on the Pacific Ocean in an open boat in which, after a voyage of three months, they succeeded in reaching the coast of Java, and procuring a small vessel returned to England. Bligh was sent in command of the Providence in 1791 to make another effort to introduce the Bread-fruit into the West Indies. In this he was successful, and it was on the return from this voyage that he brought Schæfferia to England. In 1801 he was elected a member of the Royal Society, principally on account of his services to botany. He was governor of New South Wales from 1805 to 1808, and was promoted to vice-admiral in 1814. The genus *Blighia*, established by Koenig for a plant of tropical Africa, now sometimes referred to Cupania, was dedicated to him.

EXPLANATION OF THE PLATE.

PLATE LV. SCHÆFFERIA FRUTESCENS.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a staminate flower.
4. Diagram of a pistillate flower.
5. A staminate flower, enlarged.
6. Vertical section of a staminate flower, enlarged.
7. A pistillate flower, enlarged.
8. Vertical section of a pistillate flower, enlarged.
9. An ovule, much magnified.
10. A fruiting branch, natural size.
11. A fruit, enlarged.
12. Cross section of a fruit, enlarged.
13. Vertical section of a fruit, enlarged.
14. An embryo, much magnified.



C.E.Faxon del *Picart fr. sc.*

SCHAEFFERIA FRUTESCENS, Jacq

A. Riocreux, direx.r *Imp.R. Taneur, Paris*

REYNOSIA.

Flowers perfect; calyx 5-lobed, the lobes valvate in æstivation, deciduous; petals 0 (5 ?); ovary 2 to 3-celled; ovules solitary, erect. Fruit drupaceous, 1-seeded; albumen ruminate.

Reynosia, Grisebach, *Cat. Pl. Cub.* 33. — Eggers, *Videns-kab. Medd. fra nat. For. Kjobenh.* 1877, 175.

Condalia, Baillon, *Hist. Pl.* vi. 82 (in part).

Trees or shrubs, with rigid unarmed terete branches. Leaves mostly opposite, entire, coriaceous, short-petioled, reticulate-veined, persistent; stipules minute, caducous. Flowers yellow-green, minute, in small axillary sessile umbels from scaly buds. Pedicels stout, bibracteate near the base, two or three times longer than the flower. Calyx persistent, hemispherical, with deltoid acuminate spreading petaloid lobes, the short tube filled with the fleshy disk. Stamens five, inserted on the margin of the disk, alternate with and rather shorter than the lobes of the calyx; filaments subulate, filiform, incurved; anthers oval, attached on the back below the middle, introrse, two-celled, the contiguous cells opening longitudinally. Ovary free from the disk, almost superior, conical, contracted into a short erect thick style; stigma two or three-lobed; ovules solitary, erect, anatropous; raphe ventral; micropyle inferior. Fruit ovoid, supported on the enlarged and now nearly entire calyx, and crowned with the remnants of the persistent style; sarcocarp thin, fleshy; endocarp crustaceo-membranaceous. Seed solitary by abortion, erect, ovoid, or subglobose; testa very thin, conspicuously rugose and tuberculated; albumen copious, subcorneous, ruminate. Embryo axile; cotyledons oblong; radicle long, inferior, next the hilum.[1]

The genus Reynosia is West Indian. Three species are now recognized: *Reynosia latifolia*, a small tree, extends north to the shores of southern Florida and to the Bahama Islands; the others are little known shrubs of Cuba, Ste. Croix, the Virgin group, and probably of other islands. The genus is peculiar in its thin-shelled baccate drupe and large seed, and in its ruminate albumen which gives it an anomalous position among the genera of the family to which it is referred. It was dedicated by Grisebach to Professor Alvaro Reynoso,[2] the distinguished Cuban chemist and writer on agricultural and scientific subjects.

[1] Eggers (*l. c.*) describes the flowers of Reynosia with five (or 0?) cucullate unguiculate petals inserted on the margin of the disk between the lobes of the calyx. I have been able to examine the flowers of *R. latifolia* only; these show no trace of petals.

Reynosia was referred by Baillon (*Hist. Pl. l. c.*) to Condalia, from which it differs in the thinner and less prominent disk of the flower, the thinner wall of the stone of the fruit, the longer radicle, and the ruminate albumen.

[2] Alvaro Reynoso (1830–1888); born in Duran, Cuba; studied in Paris, where he received a first prize from the Académie des Sciences for his experiments with chloroform, and later the degree of Doctor of Science. He is known by the machine invented by him for increasing the yield of sugar from Sugar-cane, and by many publications upon chemical and agricultural subjects.

REYNOSIA LATIFOLIA.

Red Iron Wood. Darling Plum.

FLOWERS in axillary umbels; petals 0. Leaves oval, oblong, or subrotund, usually emarginate.

Reynosia latifolia, Grisebach, *Cat. Pl. Cub.* 34. — Eggers, *Videnskab. Medd. fra nat. For. Kjobenh.* 1877, 173, t. 2; *Bull. U. S. Nat. Mus.* xiii. 40. — Gray, *Bot. Gazette*, iv. 208. — Chapman, *Fl.* Suppl. 612. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 39; *Garden and Forest*, iv. 15. — Trelease, *Trans. St. Louis Acad.* v. 358.

Scutia ferrea, Chapman, *Fl.* 72 (not Brongniart).

Rhamnidium revolutum, Chapman, *Fl.* Suppl. 612 (not Wright).

A slender tree, twenty to twenty-five feet in height, with a trunk six or eight inches in diameter, stout terete rigid branchlets marked with prominent elevated leaf-scars, and minute chestnut-brown acuminate buds. The bark of the trunk is from a sixteenth to an eighth of an inch thick, the dark red-brown surface dividing into large thick plate-like scales; that of the young shoots is slightly puberulous when they first appear, soon becoming glabrous, and is gray faintly tinged with red, growing darker during the second season, when it is often covered with small tubercles. The leaves are oval or oblong or sometimes nearly orbicular, rounded, truncate, or more frequently emarginate at the apex, and usually minutely apiculate; they are gradually contracted at the base into short broad petioles, and are an inch or an inch and a half long, half an inch broad, and very thick and coriaceous, with thickened revolute margins, a stout broad midrib grooved on the upper surface, about five pairs of primary veins spreading nearly at right angles, and many intricately netted veinlets; they are dark green on the upper, and rather paler or often rufous on the lower surface, and in Florida appear in April, remaining on the branches for one year and sometimes two. The flowers are produced on the shoots of the year in May; they are one twelfth of an inch long, or three times longer than the stout pedicels, with broadly deltoid acute calyx-lobes and a two or three-celled ovary. The fruit ripens in Florida in November, or frequently not until the following spring; it is half an inch long, purple or nearly black, edible, and possesses an agreeable flavor.

Reynosia latifolia is common and generally distributed on the coast and islands of southern Florida from the Marquesas group to the shores of Bay Biscayne; and it has been found in Cuba and the Virgin and Bahama Islands.

The wood of *Reynosia latifolia* is heavy and exceedingly hard, strong and close-grained; it contains numerous thin medullary rays, and is rich dark brown in color, the sapwood, which is composed of fifteen to twenty layers of annual growth, being light brown. The specific gravity of the absolutely dry wood is 1.0705, a cubic foot weighing 66.78 pounds.[1]

The earliest account of *Reynosia latifolia*[2] is that of Catesby, who figures what is evidently this plant under the name of Bullet-tree in his *Natural History of Carolina*.[3] It was first collected in Florida on Key West by Dr. J. L. Blodgett.

[1] This tree, in Florida at least, grows very slowly. The specimen of the wood in the Jesup Collection of North American Woods in the American Museum of Natural History in New York is seven inches in diameter, and is composed of one hundred and thirty-two layers of annual growth.

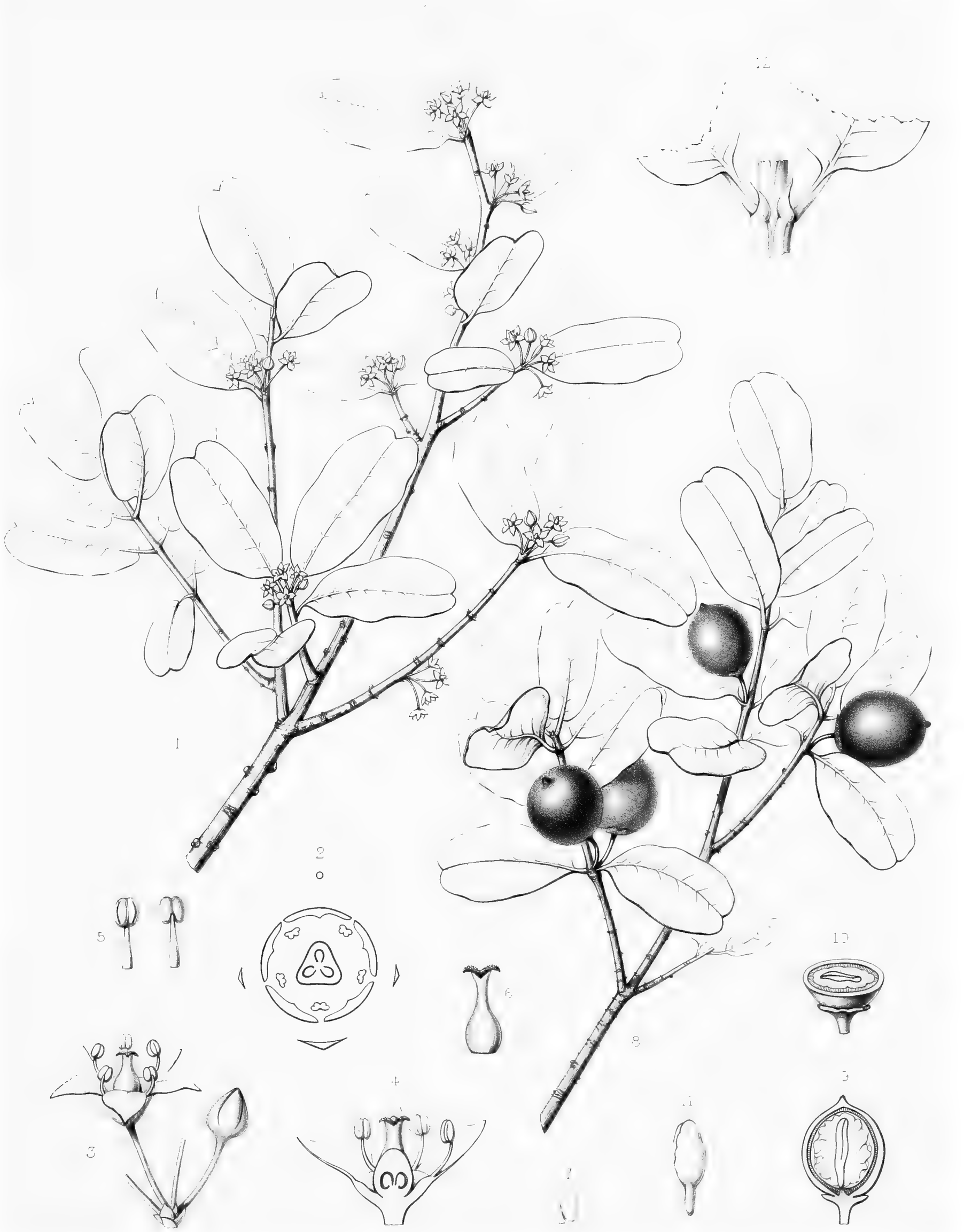
[2] *Reynosia latifolia* has been referred (Gray, *l. c.*) to *Rhamnus lævigatus*, Vahl (*Symb.* iii. 41), the *Ceanothus lævigatus*, De Candolle (*Prodr.* ii. 30). The leaves of Reynosia are usually opposite, while those of *Rhamnus lævigatus* are described as alternate, without allusion to their being emarginate at the apex, a pretty constant character in Reynosia. Professor Trelease, who examined Vahl's herbarium preserved at Copenhagen, was unable to find the type of *Rhamnus lævigatus;* and the evidence of its identity with *Reynosia latifolia* is hardly sufficient to justify the adoption of Vahl's specific name for our plant.

[3] i. 75, t. 75.

EXPLANATION OF THE PLATE.

PLATE LVI. REYNOSIA LATIFOLIA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. An umbel of flowers, enlarged.
4. Vertical section of a flower, enlarged.
5. Front and rear view of a stamen, enlarged.
6. A pistil, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, natural size.
10. Cross section of a fruit, natural size.
11. An embryo, much magnified.
12. Stipules, enlarged.



C. E. Faxon del *Picart fr sc*

REYNOSIA LATIFOLIA, Griseb

A. Riocreux direx.t *Imp. R. Taneur Paris*

CONDALIA.

FLOWERS perfect; calyx 5-lobed, the lobes valvate in æstivation; petals 0; ovary immersed in the disk, free, 1 to 2-celled; ovules solitary. Fruit drupaceous, 1 rarely 2-celled, 1-seeded.

Condalia, Cavanilles, *Anal. Hist. Nat.* i. 39. — Brongniart, *Mém. Rhamnées*, 48. — Endlicher, *Gen.* 1096. — Meisner, *Gen.* 71. — Gray, *Gen. Ill.* ii. 171. — Bentham & Hooker, *Gen.* i. 376. — Baillon, *Hist. Pl.* vi. 82.

Small trees or shrubs, usually glabrous, with rigid spinescent branches. Leaves alternate, subsessile, obovate or oblong, entire, feather-veined; stipules minute, deciduous. Flowers axillary, solitary or fascicled, short-pediceled, greenish white, minute. Calyx persistent, with a short broadly obconical tube and ovate acute membranaceous spreading lobes. Disk fleshy, flat, slightly five-angled, adnate to and filling the tube of the calyx and surrounding the free base of the ovary. Stamens five or rarely four, inserted on the free margin of the disk between the lobes of the calyx; filaments slender, subulate, incurved, shorter than the calyx-lobes; anthers introrse, attached at the middle, two-celled, the contiguous cells opening longitudinally. Ovary conical, one or sometimes two-celled by the development of a false partition, and gradually contracted into a short thick style; stigma two or three-lobed; ovules solitary, ascending from the base of the cell, anatropous; raphe ventral; micropyle inferior. Fruit ovoid or subglobose, rarely imperfectly two-celled, supported by the tube of the calyx, and crowned with the remnants of the style; sarcocarp thin and fleshy; the putamen thick, crustaceous. Seed compressed or subglobose; testa thin and smooth. Embryo surrounded by a thin layer of fleshy albumen; cotyledons oval, flat; radicle short, inferior, next the hilum.

Condalia is confined to the New World, and is widely distributed from western Texas and southern California to Patagonia and Brazil. The type of the genus, *Condalia microphylla*,[1] is a spiny undershrub of Chile. Two species inhabit Brazil,[2] and one is known to occur in Patagonia.[3] Three species belong to the arid region of northern Mexico and the adjacent portions of the United States. Of these, *Condalia obovata* is a small tree; the others, *C. spathulata*[4] and *C. Mexicana*,[5] are low many-branched spinescent shrubs.

Condalia has few economic uses. The bark of the Brazilian *C. infectoria* is rich in tannin, and is used in dyeing.[6] The fruit of *C. obovata*, the capulin of the Mexicans, is sometimes eaten by the inhabitants of Nuevo Leon.

The name of Antonio Condal,[7] a Spanish physician of the last century, is preserved by that of this genus.

[1] Cavanilles, *Anal. Hist. Nat.* i. 39, t. 4; *Icon.* vi. 16, t. 525. — De Candolle, *Prodr.* ii. 28.

[2] Reissek, *Martius Fl. Brasil.* xi., i. 90, t. 24, f. 5, 6, t. 28.

[3] Gray, *Bot. N. Pacific Explor. Exped.* i. 275.

[4] Gray, *Pl. Wright.* i. 32 (*Smithsonian Contrib.* iii.). — Hemsley, *Bot. Biol. Am. Cent.* i. 196. — Trelease, *Trans. St. Louis Acad.* v. 362.

[5] Scheele, *Linnæa*, xv. 471. — Hemsley, *l. c.* — Trelease, *l. c.*

[6] Baillon, *Hist. Pl.* vi. 70.

[7] Of Antonio Condal nothing is known beyond the fact that he was a native of Barcelona, and that when very young he was attached to the scientific expedition sent in 1754 by the Spanish government to explore its South American possessions, as assistant to the Swedish botanist, Peter Loefling, who died two years later at the Mission of Merercuri, near Cumana. (For an account of Peter Loefling and his travels, see Bossu, *Travels through Louisiana*, English ed. ii. 71.)

CONDALIA OBOVATA.

Purple Haw. Log Wood.

FLOWERS fascicled; stigma 3-lobed; ovary 1-celled.

Condalia obovata, Hooker, *Icon.* t. 287. — Torrey & Gray, *Fl. N. Am.* i. 685. — Gray, *Gen. Ill.* ii. 172, t. 164; *Jour. Bost. Soc. Nat. Hist.* vi. 169 (*Pl. Lindheim.* ii.); *Pl. Wright.* i. 32; ii. 27 (*Smithsonian Contrib.* iii., v.). — Torrey, *Bot. Mex. Bound. Surv.* 47. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 40. — Trelease, *Trans. St. Louis Acad.* v. 361.

A small tree, rising sometimes to a height of thirty feet, with a slender trunk six or eight inches in diameter, and erect rigid zigzag branches terminating in stout spines; or more often a shrub. The bark of the trunk is an eighth of an inch thick, divided into flat shallow ridges, the dark brown surface tinged with red, separating into thin scales. The bark of the young branches is gray when they first appear, and is then clothed with soft velvety pubescence; this disappears before the end of the season, when they are quite glabrous, their pale red-brown bark then often covered with thin scales. The leaves appear in May and June, and fall irregularly during the winter, a few usually remaining on the branches until the period of new growth in the following year. They are spatulate or oblong-cuneate, short-petioled, entire, mucronate, and often fascicled on the short spinescent lateral branchlets; they are half an inch to an inch long, a third of an inch broad, and rather thin, pale yellow-green, pubescent especially on the lower surface when they first appear, and glabrous at maturity, with a conspicuous midrib and about three pairs of prominent primary veins. The flowers are produced on the shoots of the year on very short stemmed two to four-flowered fascicles. The fruit ripens irregularly during the summer; it is a quarter of an inch long, dark blue or black, and possesses a sweet pleasant flavor.

Condalia obovata is generally distributed through western Texas from the shores of Matagorda Bay to the Rio Grande, and through the drier portions of northeastern Mexico. It attains a tree-like habit and its greatest size on the elevated sandy banks of the lower Rio Grande and its tributary streams. In less favored situations and on dry mesas it sometimes covers large areas with dense impenetrable chaparral.

The wood of *Condalia obovata* is very heavy, hard, and close-grained. It is light red, with light yellow sapwood composed of seven or eight layers of annual growth, and contains numerous irregularly arranged open ducts and obscure medullary rays. The specific gravity of the absolutely dry wood is 1.1999, a cubic foot weighing 74.78 pounds. The wood of this tree burns with an intense heat, and is selected for fuel in the region where it abounds.[1]

Condalia obovata was discovered in Texas in 1833, probably near the mouth of the Rio Grande, by Thomas Drummond.[2]

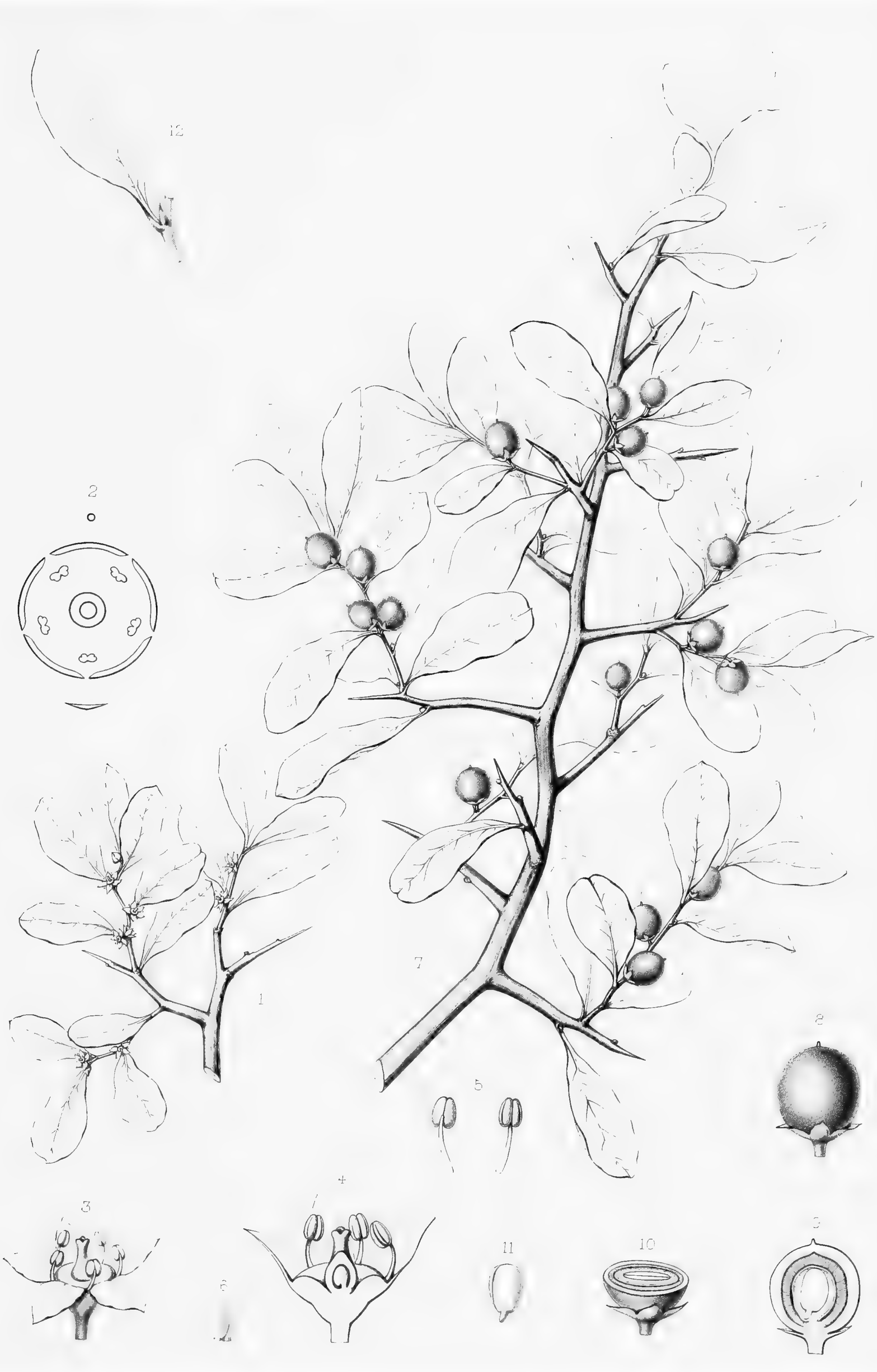
[1] C. G. Pringle, *Garden and Forest*, ii. 393. Lindheimer (Gray, *Pl. Lindheim.* ii. 169) is the only authority for the statement that the wood dyes blue, and that *Condalia obovata* is called, therefore, Blue Wood or Log Wood.

[2] Thomas Drummond (d. 1835); a native of Scotland, and one of the most industrious and successful of the botanical explorers of the North American flora. A nurseryman by profession, and then curator of the Belfast Botanic Garden, Drummond came to America in 1825 as the assistant naturalist to the second Overland Arctic Expedition under Sir John Franklin. He traveled extensively during several years in the northern and northwestern parts of the continent, and later in western Texas, which he was one of the first botanists to visit. He went to Apalachicola in 1835 for the purpose of exploring the entire Florida peninsula, but soon left western Florida with the intention of reaching Key West by the way of Havana, in which place he suddenly died. *Drummondia*, a genus of American Mosses, was dedicated to him by his patron, Sir William Jackson Hooker, by whom his plants were described. The familiar Drummond Phlox of gardens was discovered by him in Texas.

EXPLANATION OF THE PLATE.

PLATE LVII. CONDALIA OBOVATA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, rear and front view, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. A fruit, enlarged.
9. Vertical section of a fruit, enlarged.
10. Cross section of a fruit, enlarged.
11. An embryo, much magnified.
12. Leaf, with stipules, enlarged.



C.E. Faxon del

Picart fr. sc.

CONDALIA OBOVATA, Hook.

A. Riocreux direx.t

Imp R. Taneur Paris

RHAMNIDIUM.

Flowers perfect; calyx 5-lobed, the lobes valvate in æstivation; petals 5, rarely 0; ovary immersed in the disk, free, 2-celled; ovules solitary. Fruit drupaceous, 1-seeded, the seed destitute of albumen; cotyledons fleshy.

Rhamnidium, Reissek, *Martius Fl. Brasil.* xi., i. 94. — Grisebach, *Cat. Pl. Cub.* 32. — Bentham & Hooker, *Gen.* i. 378. — Baillon, *Hist. Pl.* vi. 74. — Sargent, *Garden and Forest*, iv. 16.

Small trees or shrubs, with slender unarmed terete branches covered with lenticels. Leaves opposite or obliquely opposite, oblong or ovate, entire, short-petioled, feather-veined; stipules minute, deciduous. Flowers in axillary simple or dichotomously branched cymes. Calyx turbinate or broadly obconical, the lobes triangular, acute, erect or spreading, crested on the inner surface, deciduous. Disk broad and fleshy, filling the tube of the calyx. Petals inserted under its free margin, hooded and unguiculate; or wanting. Stamens five, inserted under the margin of the disk between the lobes of the calyx; filaments subulate; anthers oblong, introrse, attached on the back below the middle, two-celled, the contiguous cells opening longitudinally. Ovary subglobose; style short and thick; stigma two-lobed; ovules ascending from the base of the cells, anatropous; raphe ventral; micropyle inferior. Fruit elliptical or subrotund, supported on the tube of the calyx and tipped with the remnants of the persistent style; sarcocarp thin, dry, or fleshy; putamen membranaceous or thick and crustaceous, usually one-celled by abortion, one-seeded. Seeds ellipsoidal, compressed; testa membranaceous. Embryo filling the cavity; cotyledons thick and fleshy, obovate or elliptical; radicle very short, inferior.[1]

Rhamnidium is confined to the warmer regions of the New World. Three species occur in southern Brazil;[2] and four are West Indian.[3] Of these, one reaches the southern coast of Florida.

The name, formed from ῥάμνος and εἶδος, indicates the relationship of these plants with Rhamnus.

[1] Rhamnidium was established for a group of Brazilian shrubs with indehiscent fruit distinguished by a very thin outer coat becoming dry at maturity, and by the thin membranaceous walls of the stone; with exalbuminous seeds having thick and fleshy cotyledons, and with prominently veined leaves. The fruit is described as baccate, but is more properly drupaceous, the putamen, although thin, being clearly defined. With these Grisebach joined three or four West Indian shrubs with thicker less prominently veined leaves and thicker-walled stones. These appear to unite our Florida tree with the Brazilian species, in spite of the fact that its flowers are apetalous. In other genera of *Rhamnaceæ*, however, some species are furnished with petals, while others are destitute of them.

[2] Reissek, *Martius Fl. Brasil.* xi., i. 94, 95, t. 24, f. 11, 12, 13, t. 25, f. 1, t. 31.

[3] Grisebach, *Cat. Pl. Cub.* 32.

RHAMNIDIUM FERREUM.

Black Iron Wood.

CALYX-LOBES conspicuously crested; petals 0. Fruit fleshy, the stone thick and bony.

Rhamnidium ferreum, Sargent, *Garden and Forest*, iv. 16.
Rhamnus ferrea, Vahl, *Symb.* iii. 41, t. 58.
Zizyphus emarginatus, Swartz, *Fl. Ind. Occ.* iii. 1954.
Myginda integrifolia, Lamarck, *Dict.* iv. 396.
Ceanothus ferreus, De Candolle, *Prodr.* ii. 30.
Scutia ferrea, Brongniart, *Mém. Rhamnées*, 56; *Ann. Sci. Nat.* x. 363 (not Chapman, *Fl.* 72).
Condalia ferrea, Grisebach, *Fl. Brit. W. Ind.* 100. — Walpers, *Ann.* vii. 588. — Gray, *Bot. Gazette*, iv. 208. — Chapman, *Fl.* Suppl. 612. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 40. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 39. — Trelease, *Trans. St. Louis Acad.* v. 362.

A low tree, rising sometimes to a height of thirty feet, with a slender trunk eight or ten inches in diameter, but generally much smaller and more often shrubby than arborescent in habit. The bark of the trunk is a quarter of an inch thick, and divided into prominent rounded longitudinal ridges, their surface broken into short thick light gray scales. The bark of the branchlets when they first appear is green and covered with dense velvety pubescence; it is glabrous in the second year, and is then gray faintly tinged with red and roughened with small crowded lenticels. The leaves are conspicuously netted-veined, glabrous with the exception of a few scattered hairs on the upper surface and petioles, broadly elliptical, emarginate-mucronate at the apex, an inch or an inch and a half long, and three quarters of an inch to an inch broad, with entire or wavy margins. They are borne on stout petioles a quarter of an inch long, are rather thin but coriaceous, bright green and lustrous on the upper surface, and pale yellow-green below, and remain on the branchlets two or sometimes three years; the stipules are acuminate, membranaceous, and early deciduous. The flowers are produced on the shoots of the year in three to five-flowered cymes borne on stout peduncles sometimes half an inch long, or usually much shorter and often branched near the apex. The pedicels are slender, bibracteolate, a quarter of an inch long and twice the length of the yellow-green calyx, which is conspicuously crested on the inner surface of the acuminate lobes. The fruit, which is usually solitary, is borne on stems a third of an inch to half an inch long; it is globose-ovoid and a third of an inch long, with thin black flesh.

Rhamnidium ferreum is widely distributed in southern Florida from Cape Canaveral on the west coast through the southern keys to the shores of Bay Biscayne. It inhabits Ste. Croix,[1] San Domingo,[2] St. Thomas,[3] Porto Rico,[4] Jamaica, and probably the other West India islands. On the Florida keys *Rhamnidium ferreum* is one of the most common of the small trees which, with the Eugenias, the Reynosia, the Citharexylum, and the Pisonias, compose a large part of the shrubby thickets which have replaced their original forest covering.

The wood of *Rhamnidium ferreum* is exceedingly heavy, hard, strong, and close-grained, although brittle and difficult to work. It contains numerous thin medullary rays, and is rich orange-brown in color, the thin sapwood being lighter colored. The specific gravity of the absolutely dry wood is 1.3020, a cubic foot weighing 81.14 pounds. The wood of this tree is remarkable for the large amount of ash — 8.31 per cent. — which is left when it is burned.

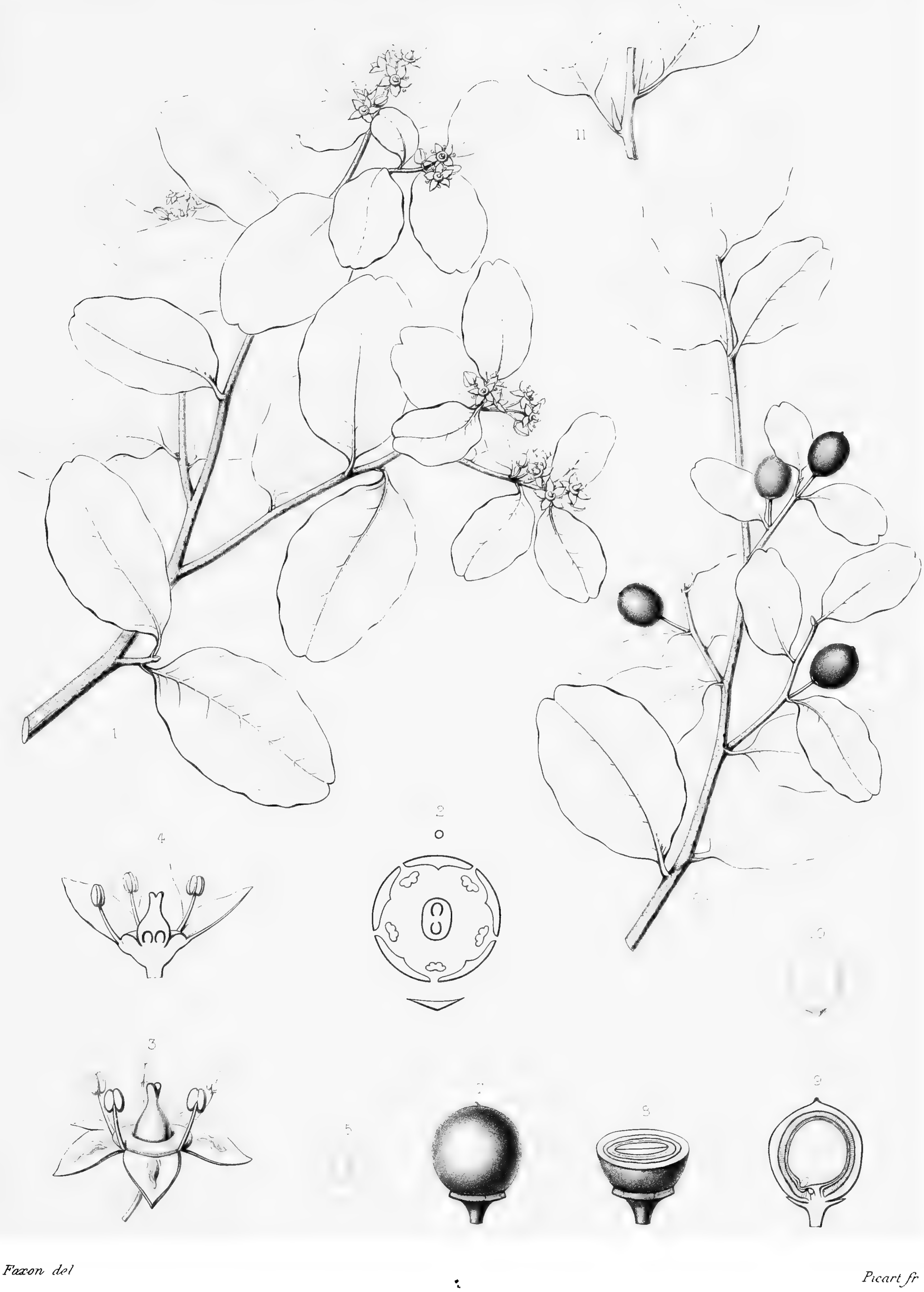
Rhamnidium ferreum was discovered in Florida on Key West in 1846 by Dr. Ferdinand Rugel.

[1] Vahl, *l. c.*
[2] Eggers, *Fl. Ind. Occ. Exs.* 1887, No. 1925.
[3] Eggers, No. 171.
[4] P. Sintenis, *Plantæ Portoricenses*, No. 4824.

EXPLANATION OF THE PLATE.

PLATE LVIII. RHAMNIDIUM FERREUM.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. An ovule, much magnified.
6. A fruiting branch, natural size.
7. A fruit, enlarged.
8. Cross section of a fruit, enlarged.
9. Vertical section of a fruit, enlarged.
10. An embryo, much magnified.
11. Stipules, enlarged.



C. E. Faxon del

Picart fr sc.

RHAMNIDIUM FERREUM, Sarg.

A. Riocreux direx.

Imp. R. Taneur. Paris

RHAMNUS.

FLOWERS perfect or polygamo-diœcious; calyx 4 or 5-lobed, the lobes valvate in æstivation; petals 4 or 5 or 0, inserted on the margin of the disk; ovary free, 2 to 4-celled. Fruit drupaceous, 2 to 4-coccous.

Rhamnus, Linnæus, *Gen.* 58. — Adanson, *Fam. Pl.* ii. 305. — A. L. de Jussieu, *Gen.* 380. — Brongniart, *Mém. Rhamnées*, 53. — Endlicher, *Gen.* 1097. — Meisner, *Gen.* 71. — Gray, *Gen. Ill.* ii. 179. — Bentham & Hooker, *Gen.* i. 377. — Baillon, *Hist. Pl.* vi. 74.

Frangula, Adanson, *Fam. Pl.* ii. 305. — Gray, *Gen. Ill.* ii. 177.

Cardiolepis, Rafinesque, *Neogen.* 1; *Sylva Tellur.* 28.

Sarcomphalus, Rafinesque, *Sylva Tellur.* 29.

Sciadophila, Philippi, *Linnæa*, xxviii. 618.

Small trees or shrubs, with terete, often spinescent branches and acrid bitter bark. Leaves alternate or rarely obliquely opposite, conduplicate in vernation, petiolate, feather-veined, entire or dentate; stipules small, deciduous. Flowers in axillary simple or compound racemes or fascicled cymes, small, green, or yellow-green. Calyx campanulate, the lobes triangular-ovate, erect or spreading, keeled on the inner surface, deciduous. Disk lining the tube of the calyx, thin below, more or less thickened above. Petals inserted in its margin, alternate with the lobes of the calyx, unguiculate, entire, emarginate, or two-lobed, concave or cucullate, involute around the stamens in æstivation, deciduous. Stamens as many as and opposite the petals; filaments very short, subulate; anthers didymous, introrse, two-celled, the cells opening longitudinally; rudimentary and sterile in the pistillate flower. Ovary free, ovoid, included in the tube of the calyx, two to four-celled; rudimentary in the sterile flower; styles united below, with spreading stigmatic lobes, or terminating in a two to four-lobed obtuse stigma; ovules solitary, erect from the base of the cells, anatropous; raphe ventral, becoming in one section lateral and in the other dorsal by the torsion of the short funiculus. Fruit oblong or spherical, supported on the circular base of the calyx; sarcocarp thick and fleshy, inclosing two to four separable cartilaginous one-seeded indehiscent or more or less dehiscent nutlets. Seed erect, obovate, grooved longitudinally on the back, with a cartilaginous testa, the raphe in the groove; or convex on the back with a membranaceous testa, the raphe lateral next to one margin of the cotyledons. Embryo large, surrounded with thin fleshy albumen; cotyledons oval, foliaceous with revolute margins, or flat and fleshy; radicle very short, turned a little from the hilum.[1]

The genus Rhamnus is widely distributed in nearly all the temperate and in many tropical parts of the world, with the exception of Australia and the islands of the Pacific Ocean. About sixty species are distinguished. They occur principally in Europe[2] and in the Orient,[3] in southern and eastern Asia,[4] and in North America.[5] The genus is represented in the West Indies,[6] Central America,[7]

[1] The genus Rhamnus is separated into the following sections which are considered genera by many authors: —

1. EURHAMNUS. Flowers usually polygamo-diœcious, lobes of the stigma spreading. Seed grooved on the back; testa cartilaginous; raphe dorsal; cotyledons foliaceous, with revolute margins. Inflorescence mostly sessile. Branches often furnished with blunt spines; winter-buds scaly.

2. FRANGULA. Flowers perfect; lobes of the stigma short and obtuse, more or less united. Seed rounded on the back; testa membranaceous; raphe lateral; cotyledons thick and fleshy. Inflorescence pedunculate. Branches unarmed; winter-buds naked. (Tournefort, *Inst.* 612, t. 383.)

[2] Nyman, *Conspect. Fl. Europ.* 145.

[3] Boissier, *Fl. Orient.* ii. 14.

[4] Hooker f. *Fl. Brit. Ind.* i. 638. — Thwaites, *Enum. Pl. Zeylan.* 74. — Maximowicz, *Mém. Acad. Sci. St. Pétersbourg*, ser. 7, x. No. 11, 6. — Franchet & Savatier, *Enum. Pl. Jap.* i. 82. — Franchet, *Pl. David.* i. 72. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 128.

[5] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vii. 50, t. 616–619. — Bentham, *Pl. Hartweg.* 9, 302. — Torrey & Gray, *Fl. N. Am.* i. 260. — Hemsley, *Bot. Biol. Am. Cent.* i. 197. — Trelease, *Trans. St. Louis Acad.* v. 365.

[6] Grisebach, *Fl. Brit. W. Ind.* 99.

[7] Hemsley, *l. c.*

Brazil,[1] and the Canary Islands,[2] and in northern, tropical, and southern Africa.[3] About eighteen species inhabit North America, most of them being confined to the region south of the United States. Of the five species indigenous to the United States two belong to the Atlantic flora, and two to the Pacific flora, while one ranges across the continent.

The fruit and bark of Rhamnus are drastic, and yield yellow and green dyes. From the fruit of *Rhamnus cathartica*,[4] a native of Europe and now naturalized in some parts of eastern America, a syrup possessing strong purgative properties is prepared,[5] while its bark is used for dyeing yellow. The fruit of the European *R. infectoria* and of several allied species yields valuable dyes, and has considerable commercial importance. *R. tinctoria*,[6] a shrub of southeastern Europe and of China, and *R. Davurica*[7] furnish the China green[8] of commerce. The bark of the North American *R. Purshiana* is a powerful purgative, and the bark of *R. Frangula*[9] is used in dyeing yellow, while its soft porous wood is prized in the manufacture of gunpowder, and its fruit is employed in veterinary practice.[10] *R. cathartica* has for centuries been a common hedge-plant in northern Europe and in the northern United States, and several varieties differing from the wild plant in habit and in the color of the fruit have appeared in gardens.[11]

The generic name is derived from ῥάμνος, the classical Greek name of the Buckthorn.

[1] Reissek, *Martius Fl. Brasil.* xi., i. 91, t. 24, f. 9, t. 29.

[2] Webb & Berthelot, *Phytogr. Canar.* ii. 2, 130, t. 67.

[3] Ball, *Jour. Linn. Soc.* xvi. 391. — Oliver, *Fl. Trop. Afr.* i. 381. — Harvey & Sonder, *Fl. Cap.* i. 476.

[4] Linnæus, *Spec.* 193. — De Candolle, *Prodr.* ii. 24. — Trelease, *Trans. St. Louis Acad.* v. 365. — Watson & Coulter, *Gray's Man.* ed. 6, 112.

[5] Woodville, *Med. Bot.* ii. 312, t. 114. — Flückiger & Hanbury, *Pharmacographia*, 139. — *U. S. Dispens.* ed. 14, 759. — Stillé & Maisch, *Nat. Dispens.* ed. 2, 1223. — Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 41, t. 41. — Maisch, *Organic Mat. Med.* ed. 4, 323.

[6] Waldstein & Kitaibel, *Pl. Rar. Hung.* iii. 283, t. 255. — Boissier, *Fl. Orient.* ii. 18. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 129 (*R. chlorophora*, Decaisne, *Compt. Rend.* xl. 1140).

[7] Pallas, *Fl. Ross.* ii. 24, t. 61. — Ledebour, *Fl. Ross.* i. 502. — Forbes & Hemsley, *l. c.* 128 (*R. utilis*, Decaisne, *l. c.*).

[8] Rondot, *Notice du Vert de Chine et de la Teinture en vert chez les Chinois.*

[9] Linnæus, *Spec.* 193. — De Candolle, *Prodr.* ii. 26.

[10] Baillon, *Hist. Pl.* vi. 69.

[11] Duhamel, *Traité des Arbres*, ii. 214, t. 50. — Loudon, *Arb. Brit.* ii. 531.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

EURHAMNUS. Flowers polygamo-dicœcious; seed grooved on the back; raphe dorsal; cotyledons foliaceous; winter-buds scaly.

Fruit red; nutlets dehiscent; leaves persistent . . . . . 1. R. CROCEA.

FRANGULA. Flowers perfect; seed rounded on the back; raphe lateral; cotyledons thick and fleshy; winter-buds naked.

Peduncles shorter than the petioles; leaves deciduous . . . . . 2. R. CAROLINIANA.

Peduncles much longer than the petioles; leaves deciduous or subpersistent . . . . 3. R. PURSHIANA.

RHAMNUS CROCEA.

PARTS of the flower in 4's. Fruit red; nutlets dehiscent on the inner angle. Leaves evergreen, often sharply toothed.

Rhamnus crocea, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 261. — Lindley, *Jour. Hort. Soc. Lond.* vi. 217, f. — Paxton, *Brit. Fl. Gard.* ii. 821. — Torrey, *Pacific R. R. Rep.* iv. 74; *Bot. Mex. Bound. Surv.* 46; *Bot. Wilkes Explor. Exped.* 262. — Watson, *Proc. Am. Acad.* xi. 114. — Brewer & Watson, *Bot. Cal.* i. 100. — Mary K. Curran, *Proc. Cal. Acad.* ser. 2, i. 251. — Trelease, *Trans. St. Louis Acad.* v. 365.

R. ilicifolia, Kellogg, *Proc. Cal. Acad.* ii. 37.

A small tree, rising occasionally to the height of twenty feet, with a slender trunk six or eight inches in diameter, and spreading rigid sometimes spinescent branches; or more frequently a low matted shrub with stems a few feet high forming thickets of considerable extent. The bark of the trunk is usually from an eighth to a sixteenth of an inch thick, the dark gray surface being slightly roughened with minute tubercles. The bark of the branchlets when they first appear is puberulous or glabrate and yellow-green, but becomes dark red or reddish brown and quite glabrous in their second season. The winter-buds are obtuse and barely more than a sixteenth of an inch long, with slightly puberulous apiculate scales with ciliate margins. The leaves are alternate, elliptical, broadly ovate or subrotund or rarely lanceolate-acuminate, mucronate, rounded or emarginate at the apex, acutely or often glandular-denticulate, sometimes revolute, a quarter of an inch to three inches long, with short stout petioles, prominent midribs grooved above, and broad conspicuous primary veins. They are persistent, coriaceous, yellow-green, and lustrous on the upper surface, paler or frequently bronzed or copper-colored below, glabrous or often puberulous, especially when young, on the under surface of the midribs and on the petioles. The stipules are membranaceous, acuminate, and early deciduous. The flowers are dicœcious and destitute of petals, and are produced on the shoots of the year in small clusters from the axils of leaves or of small lanceolate persistent bracts. The pedicels are slender, often puberulous, an eighth of an inch long and rather longer than the narrowly campanulate calyx, with acuminate lobes. The stamens are included, with short stout incurved filaments and large ovate anthers, which are minute and rudimentary in the fertile flowers. The ovary, which is reduced in the staminate flowers to a mere rudiment, is ovate and contracted into a long slender style, divided above the middle into two wide-spreading acuminate stigmatic lobes. The fruit[1] is red, obovoid, slightly grooved or lobed at maturity, and a quarter of an inch long, with dry thin flesh and one to three nutlets which open along the inner angle. The seed is broadly ovate, pointed at the apex and deeply grooved on the back, with a thin membranaceous pale chestnut-colored testa and thick curved fleshy cotyledons.[2]

Rhamnus crocea is widely distributed west of the Sierra Nevada Mountains from the valley of the upper Sacramento River to at least latitude 28° on the mainland, and to Guadaloupe Island, Lower California.[3] It usually grows as an undershrub beneath the shade of trees and along the borders of the forest or in sheltered ravines, preferring the northern slopes of mountains, although sometimes

[1] Brewer & Watson (*Bot. Cal.* i. 101) state that the ripe fruit of *Rhamnus crocea* is used by the Indians as food; and that "their veins are said to become tinged by a deposition of the red coloring matter."

[2] *Rhamnus crocea* varies in the amount and density of the pubescence which clothes the foliage and young shoots. A form with narrow revolute leaves and densely pilose throughout inhabits Santa Maria valley in the mountains near San Diego. It is the variety *pilosa* (Mary K. Curran, *Proc. Cal. Acad.* ser. 2, i. 251. — Trelease, *Trans. St. Louis Acad.* v. 365). The flowers of this peculiar plant have not been seen.

[3] This species has been said to extend into Arizona (Watson, *Cat. Pl. Wheeler*, 7. — Brewer & Watson, *Bot. Cal.* i. 100), but no record of the locality is preserved, and it is perhaps doubtful whether it occurs anywhere east of the Sierra Nevada.

appearing in exposed situations on sunny hillsides or in the neighborhood of the ocean. It is tree-like in habit and size only in a few favored localities in some of the interior valleys of central California, and on Cedros Island and the Santa Barbara group, where, as also on the mountains of the adjacent mainland, an arborescent form[1] occurs having prominently toothed leaves, rather larger flowers with a shorter calyx-tube, shorter and broader calyx-lobes, a less deeply divided style, and larger fruit.

Rhamnus crocea was discovered in 1836 near Monterey by Thomas Nuttall.[2] It was introduced into England by Theodore Hartweg[3] in 1846, but probably was soon lost from gardens. It is well worth cultivating in all temperate regions for its bright evergreen foliage and brilliant red fruit.

[1] *Rhamnus crocea*, var. *insularis*, Sargent, *Garden and Forest*, ii. 364.

R. insularis, Greene, *Bull. Cal. Acad.* ii. 392; *Pittonia*, i. 201.

R. crocea, Lyon, *Bot. Gazette*, xi. 333. — Brandegee, *Proc. Cal. Acad.* ser. 2, i. 225. — Vasey & Rose, *Contrib. U. S. Nat. Herb.* i. 14.

This is a tree often growing to the height of twenty-five or thirty feet, and flowering six weeks later than the ordinary form of *R. crocea*. Flowers provided with petals are said to occur (Trelease, *Trans. St. Louis Acad.* v. 365), but I have not seen them.

[2] Thomas Nuttall (1786–1859); a native of Settle in the West Riding of Yorkshire, and from 1807 to 1842 a resident of the United States, where he made many long and arduous journeys in the prosecution of his studies in natural history. Nuttall was an accomplished and distinguished naturalist, and one of the most indefatigable and judicious of the botanists who have studied the North American flora. Among his numerous publications are some of the most valuable contributions that have been made in the field of North American botany; and his work on North American birds is still an authority on the subject. In 1834 Nuttall was appointed curator of the Botanic Garden of Harvard College, and instructor in botany. The duties of the office were not congenial to him, as they interfered with his love for travel and prevented him from carrying on his investigations in the field, and he appears to have passed only a small part of his time in Cambridge. He resigned his position in 1842 and returned to England to take possession of a handsome estate bequeathed to him by an uncle, and to indulge his taste for horticulture. *Nuttallia*, a handsome shrub of Oregon and California belonging to the Rose family, fixes the name of Nuttall in the annals of botany, and serves to commemorate his early explorations and his hardships and dangers on the plains and in the forests of the far West.

[3] Karl Theodore Hartweg (1812–1871) was a native of Carlsruhe, and the descendant of a long race of famous gardeners. At an early age he found employment in the Jardin des Plantes in Paris, and afterwards in London in the garden of the Royal Horticultural Society, where his industry and intelligence soon attracted attention and led to his being sent to Mexico by the society to collect plants and seeds. In 1836 Hartweg left England on this mission, passing seven years in Mexico, central and western equatorial America, and in Jamaica, making important discoveries, including many coniferous trees of the Mexican highlands, and several orchids which he successfully introduced into cultivation. Hartweg returned to Mexico in 1845, and was in California in 1846 and 1847, spending much of his time at Monterey and penetrating to the upper valley of the Sacramento River. On his return to Europe he was appointed by his friend, the Grand Duke of Baden, inspector of the ducal gardens at Schwetzingen, a position which he continued to fill during the remainder of his life. His American plants were described by Bentham in the *Plantæ Hartwegianæ*. *Hartwegia*, an epiphytal orchid, which he first found growing on the eastern declivities of Mount Orizaba, was named by Lindley in honor of its discoverer.

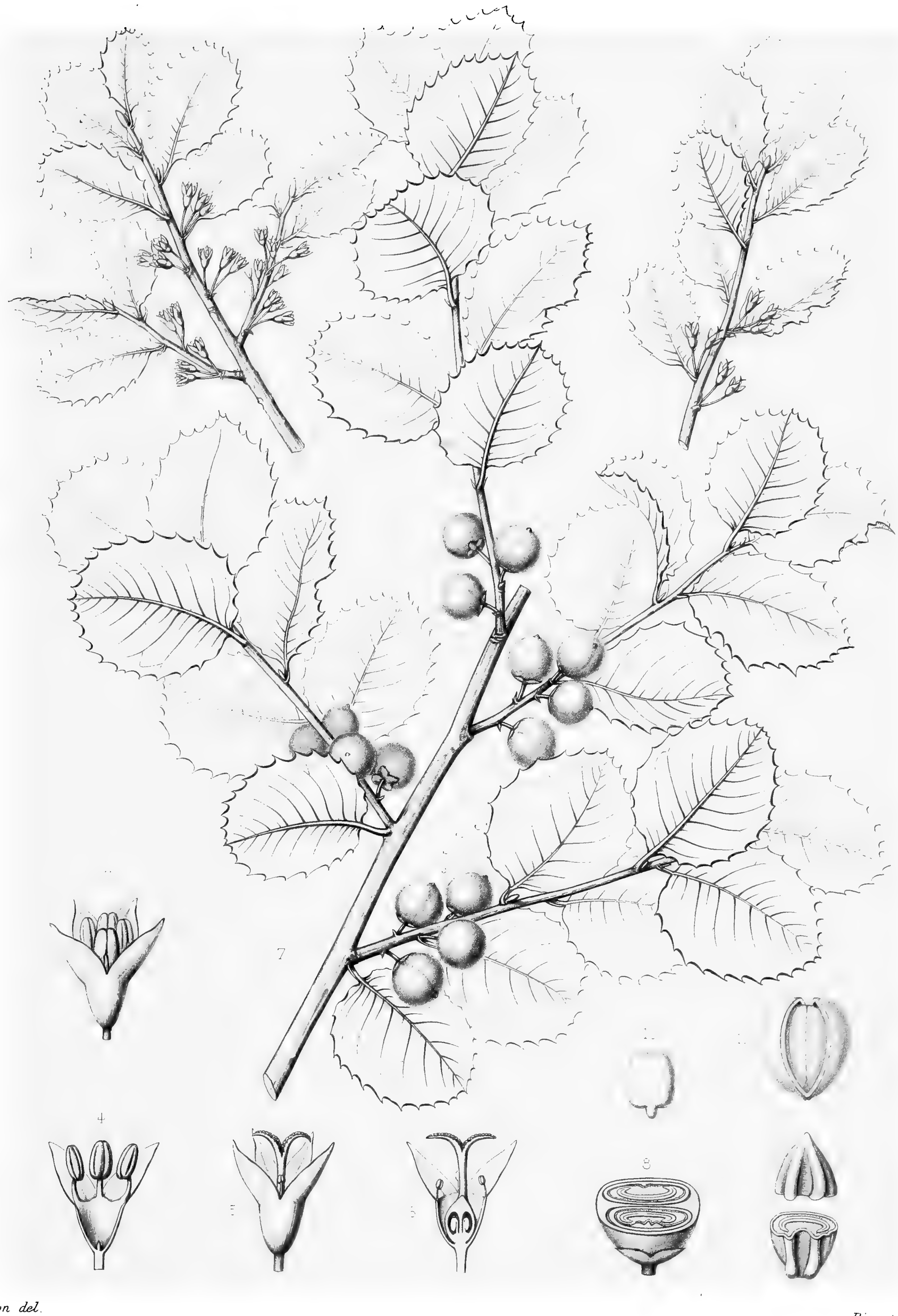
EXPLANATION OF THE PLATES.

PLATE LIX. RHAMNUS CROCEA.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Cross section of a fruit, enlarged.
9. A seed divided transversely, enlarged.
10. An embryo, much magnified.
11. Nutlet showing the dehiscence, enlarged.

PLATE LX. RHAMNUS CROCEA, var. INSULARIS.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Cross section of a fruit, enlarged.
9. Vertical section of a fruit, enlarged.
10. A seed divided transversely, enlarged.
11. An embryo, much magnified.



C. E. Faxon del. Picart fr. sc.

RHAMNUS CROCEA, Nutt.

A Riocreux direx.t Imp. R. Taneur, Paris

C.E Faxon del. Picart fr sc.

RHAMNUS CROCEA, Var. INSULARIS, Sarg.

A. Riocreux direx.t Imp. R. Taneur. Paris.

RHAMNUS CAROLINIANA.

Indian Cherry.

PARTS of the flower in 5's; peduncles shorter than the petioles. Leaves deciduous.

Rhamnus Caroliniana, Walter, *Fl. Car.* 101. — Lamarck, *Ill.* ii. 88; *Dict.* iv. 476. — Michaux, *Fl. Bor.-Am.* i. 153. — *Nouveau Duhamel*, iii. 47. — Persoon, *Syn.* i. 239. — Pursh, *Fl. Am. Sept.* i. 166. — Nuttall, *Gen.* i. 152; *Sylva*, ii. 50, t. 59. — Roemer & Schultes, *Syst.* v. 285. — Elliott, *Sk.* i. 289. — De Candolle, *Prodr.* ii. 26. — Sprengel, *Syst.* i. 768. — Don, *Gen. Syst.* ii. 32. — Torrey & Gray, *Fl. N. Am.* i. 262. — Dietrich, *Syn.* i. 807. — Koch, *Dendr.* i. 610. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 40. — Trelease, *Trans. St. Louis Acad.* v. 366. — Watson & Coulter, *Gray's Man.* ed. 6, 112.

Frangula fragilis, Rafinesque, *Fl. Ludovic.* 97; *Sylva Tellur.* 27.

Sarcomphalus Carolinianus, Rafinesque, *Sylva Tellur.* 29.

Frangula Caroliniana, Gray, *Gen. Ill.* ii. 178, t. 167; *Man.* ed. 5, 115. — Curtis, *Rep. Geolog. Surv. N. Car.* iii. 92. — Chapman, *Fl.* 73.

A slender tree, thirty or thirty-five feet high, with a trunk six or eight inches in diameter, and slender spreading unarmed branches; or more often a tall shrub sending up numerous stems to the height of fifteen or twenty feet. The bark of the trunk is an eighth of an inch thick, slightly furrowed, ashy gray, and often marked with large black blotches. That of the branchlets when they first appear is light red-brown and puberulent or covered with a glaucous bloom; it becomes gray during the second season, when the branches are slightly angled, glabrous, and conspicuously marked with the elevated scars left by the falling of the leaves. These are alternate, elliptical, oblong or broadly elliptical, acute or acuminate, wedge-shaped or somewhat rounded at the base, remotely and obscurely serrate or crenulate, and densely coated when they first appear with rusty brown tomentum; they are borne on slender pubescent petioles half an inch to nearly an inch in length, and are membranaceous, two to six inches long, an inch to nearly two inches broad, glabrous or somewhat hairy on the lower surface at maturity, dark yellow-green above and paler below, with a prominent yellow midrib and about six pairs of conspicuous yellow primary veins. The stipules are minute, nearly triangular, and early deciduous. The flowers appear from April to June in the axils of the leaves after these are almost fully grown; they are arranged in few-flowered pubescent umbels borne on peduncles varying from an eighth of an inch to almost half an inch in length. The pedicels are slender, a quarter of an inch long or half the length of the calyx, which has a narrow turbinate tube and triangular lobes. The petals are minute, broadly ovate, and deeply notched at the apex, and are folded around the short stamens. The ovary is contracted into a long columnar style terminated with the slightly three-lobed stigma. The fruit ripens in September, and sometimes remains on the branches during the month of November; it is globose, a third of an inch in diameter, and black at maturity, with thin sweet rather dry flesh and two to four indehiscent nutlets.

Rhamnus Caroliniana is found from Long Island, New York, to northern Florida; it extends westward through the valley of the Ohio River to eastern Nebraska, eastern Kansas, and eastern Texas. It is found along the borders of streams in rich bottom-lands, and is abundant on those limestone barrens of eastern Kentucky and Tennessee which are covered with thickets of the Red Cedar. In western Florida and in Mississippi the Indian Cherry is occasionally tree-like in habit, but its greatest size is reached only in southern Arkansas and the adjacent portions of Texas, where it often develops into a small shapely tree.

The wood of *Rhamnus Caroliniana* is rather hard, although light, close-grained, and not strong; it contains numerous thin medullary rays, and is light brown, the sapwood, composed of five or six

layers of annual growth, being rather lighter colored. The specific gravity of the absolutely dry wood is 0.5462, a cubic foot weighing 34.04 pounds.

Rhamnus Caroliniana, according to Loudon,[1] was introduced into English gardens in 1819; it is rarely seen in cultivation. Few insects are known to devour the foliage or injure the wood of this plant.[2]

[1] *Arb. Brit.* ii. 536.

The plant usually grown in European botanic gardens under this name is the European *Rhamnus Frangula*, L., which closely resembles *Rhamnus Caroliniana.*

[2] Various general-feeding insects attack the foliage of the American species of Rhamnus, especially different species of Clisiocampa or Web-worms; and *Hyphantria cunea*, Drury, has been known to bore into the wood. Henry Edwards (*Proc. Cal. Acad.* v. 164) mentions that *Papilio Eurymedon*, Boisd., feeds upon the foliage of *Rhamnus Purshiana.*

EXPLANATION OF THE PLATE.

PLATE LXI. RHAMNUS CAROLINIANA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A petal, enlarged.
6. A stamen, enlarged.
7. A pistil, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Cross section of a fruit, enlarged.
11. A nutlet, enlarged.
12. Vertical section of a nutlet, enlarged.
13. A seed, enlarged.
14. An embryo, much magnified.

C.E Faxon del. Picart fr. sc.

RHAMNUS CAROLINIANA, Walt.

A Riocreux direx.t. Imp R Taneur. Paris

RHAMNUS PURSHIANA.

Bearberry. Coffee Tree.

PARTS of the flower usually in 5's, sometimes in 4's; peduncles longer than the petioles. Leaves deciduous or subpersistent.

Rhamnus Purshiana, De Candolle, *Prodr.* ii. 25. — Loudon, *Arb. Brit.* ii. 538, f. 211. — Hooker, *Fl. Bor.-Am.* i. 123, t. 43; *London Jour. Bot.* vi. 78. — Don, *Gen. Syst.* ii. 32. — Torrey & Gray, *Fl. N. Am.* i. 262. — Dietrich, *Syn.* i. 807. — Nuttall, *Sylva*, ii. 52. — Newberry, *Pacific R. R. Rep.* vi. 69. — Koch, *Dendr.* i. 610. — Gray, *Proc. Am. Acad.* viii. 379. — Brewer & Watson, *Bot. Cal.* i. 101. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 41; *Garden and Forest*, iv. 75. — Trelease, *Trans. St. Louis Acad.* v. 366. — H. H. Rusby, *Druggists' Bull.* iv. 334, f. 1, 6, 7, 8.

R. alnifolia, Pursh, *Fl. Am. Sept.* i. 166 (not L'Héritier).

R. Californica, Eschscholtz, *Mém. Acad. Sci. St. Pétersbourg*, x. 285. — Don, *Gen. Syst.* ii. 32. — Torrey & Gray, *Fl. N. Am.* i. 263. — Dietrich, *Syn.* i. 806. — Brewer & Watson, *Bot. Cal.* i. 101. — Hemsley, *Bot. Biol. Am. Cent.* i. 197. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 40. — Trelease, *Trans. St. Louis Acad.* v. 366. — Mary K. Curran, *Proc. Cal. Acad.* ser. 2, i. 252. — Mary K. Brandegee, *Zoë*, i. 240. — H. H. Rusby, *Druggists' Bull.* iv. 335, f. 2, 3, 9.

R. oleifolia, Hooker, *Fl. Bor.-Am.* i. 123, t. 44. — Hooker & Arnott, *Bot. Voy. Beechey*, 136, 328. — Torrey & Gray, *Fl. N. Am.* i. 260. — Bentham, *Bot. Voy. Sulphur*, 10; *Pl. Hartweg.* 302. — Carrière, *Rev. Hort.* xlvi. 354, f. 47, 49.

Cardiolepis obtusa, Rafinesque, *Sylva Tellur.* 28.

Perfonon laurifolium, Rafinesque, *Sylva Tellur.* 29.

Endotropis oleifolia, Rafinesque, *Sylva Tellur.* 31.

R. laurifolia, Torrey & Gray, *Fl. N. Am.* i. 260.

Frangula Californica, Gray, *Gen. Ill.* ii. 178; *Proc. Bost. Soc. Nat. Hist.* vii. 146. — Torrey, *Sitgreaves' Rep.* 157; *Pacific R. R. Rep.* iv. 74; *Bot. Mex. Bound. Surv.* 46; *Bot. Wilkes Explor. Exped.* 261. — Newberry, *Pacific R. R. Rep.* vi. 69. — Bolander, *Proc. Cal. Acad.* iii. 78.

Frangula Purshiana, Cooper, *Smithsonian Rep.* 1858, 259; *Pacific R. R. Rep.* xii. 29, 57. — Torrey, *Bot. Wilkes Explor. Exped.* 262.

R. rubra, Greene, *Pittonia*, i. 68, 160.

R. Californica, var. rubra, Trelease, *Trans. St. Louis Acad.* v. 367.

A tree, thirty-five to forty feet in height, with a slender trunk often eighteen or twenty inches in diameter, separating, ten or fifteen feet from the ground, into numerous stout upright or sometimes nearly horizontal branches; often shrubby and occasionally prostrate. The bark of the trunk, even on old individuals, is rarely more than a quarter of an inch thick; and varies in color from dark brown to light brown or gray tinged with red, the surface being broken into short thin scales. The branchlets when they first appear are coated with fine soft pubescence; they are pale yellow-green or reddish brown, and are pubescent, glabrous, or covered with scattered hairs in their second season, when they are marked with large elevated scars left by the falling of the leaves. These are alternate, elliptical-oblong, obovate, acuminate, or broadly elliptical, and are obtuse, acute, or bluntly pointed at the apex, rounded, subcordate, or sometimes wedge-shaped at the base, and serrulate, denticulate, obscurely crenate, or often nearly entire with wavy margins. They are thin and membranaceous or sometimes thick and coriaceous, and are glabrous or pubescent with scattered hairs on the lower surface and along the veins on the upper surface. They vary from an inch to over seven inches in length and are conspicuously netted-veined, with broad and prominent midrids and primary veins; they are borne on stout often pubescent petioles half an inch or an inch long; and are sometimes pale yellow-green above and below, and sometimes dark green and rather opaque above and paler or often somewhat orange-colored or brown on the lower surface. In Washington and Oregon and at high elevations in the mountains they fall late in November, having previously turned pale yellow. Farther south and near the California coast they remain on the branches almost all winter, or until the following spring. The stipules are membranaceous, acuminate, and early deciduous. The flowers are produced on the young

shoots in axillary umbellate cymes on slender pubescent peduncles varying from half an inch to nearly an inch in length.[1] The pedicels are slender, pubescent, a quarter of an inch to almost an inch long, and four or five times longer than the calyx, which is narrowly campanulate with more or less spreading acuminate lobes. The petals are minute, ovate, and deeply emarginate at the apex, and enfold the short stamens whose filaments are somewhat thickened at the base. The style is crowned with a slender two to three-lobed stigma. The fruit is globose or broadly obovoid, a third to half an inch in diameter, and very slightly or not at all lobed, with thin rather juicy pulp and two or three nutlets. It is at first green, then red, and finally black at maturity. The nutlets are obovate, usually a third of an inch long, rounded on the back, and flattened on the inner surface by mutual pressure, with two bony tooth-like enlargements at the base, one on each side of the large scar of the hilum, and a thin gray or pale yellow-green shell. The testa of the seed is thin and papery, its outer surface of a yellow-brown color, and its inner surface, like the cotyledons, bright orange-colored.[2]

Rhamnus Purshiana is widely and very generally distributed from the region surrounding Puget Sound southward into Lower California; it extends eastward along the mountain ranges of northern Washington to the Bitter Root range in Idaho and the shores of Flat Head Lake in Montana. It occasionally occurs on the eastern slopes of the Sierra Nevada Mountains and reappears on the mountains of Colorado and western Texas. In one of its forms it is scattered through the mountainous portions of southern California, Arizona, New Mexico, and northern Mexico. *Rhamnus Purshiana* is a shade-loving plant. In northern California and in the region west of the Cascade Mountains in Washington and Oregon, where it attains its greatest size, it is usually found along the bottoms and the sides of cañons, growing under the shelter of coniferous forests. Farther south in California it occurs on cool northern hillsides about the margins of the forest, or in sheltered ravines where it receives the protection of other trees and shrubs, and where it occasionally assumes the size and habit of a small tree. In the immediate neighborhood of the California coast, where *Rhamnus Purshiana* sometimes rises only to the height of a few inches, with prostrate stems forming broad cushions of scanty foliage, and in the Sierra Nevada at elevations of more than two thousand feet above the sea-level, as in the region south and east of these mountains, it occupies more exposed situations, and does not assume the habit of a tree.[3]

The wood of *Rhamnus Purshiana* is light, soft or hard, and not strong. It contains numerous thin medullary rays, and broad bands of open ducts marking the layers of annual growth. It is brown

[1] In some parts of California near the coast the flowers of *Rhamnus Purshiana*, like those of many species of Frangula, continue to appear during the growing season, which lasts until the advent of frost, and it is not uncommon to find expanding flower-buds and ripe fruit on the branch of a single season. The fruit is red for only a short time, deepening gradually in color until it becomes black. The first crop, the only one in regions of scanty rainfall, ripens usually in September and October.

[2] Extreme forms of the black-fruited Rhamnus of western America are easily distinguished, although they are connected by so many intermediate forms that it does not seem practicable to characterize them specifically, or even to find satisfactory varietal characters for them, except in the case of the plant of the Mexican-boundary region. The differences consist in the shape, size, and texture of the leaves, and not in the more essential characters of flower and fruit, which do not vary in any important respect in the innumerable forms this plant assumes under the influence of widely dissimilar climatic surroundings. In the humid atmosphere of the northwest-coast region and of the northern Rocky Mountains, where *Rhamnus Purshiana* grows in the dense shade of coniferous forests, it becomes a tree with slightly pubescent bright red or green branchlets, and large thin broadly elliptical obtuse or abruptly pointed deciduous leaves, rounded or sometimes even cordate at the base, and somewhat hairy on the upper surface and on the principal veins below, with short pubescent petioles and prominent veins. In the less humid climate of central California the leaves are semipersistent, usually thicker and smaller, and often lanceolate and acuminate. The pubescence increases as humidity decreases, the principal veins are less prominent, and their reticulation is more conspicuous. In central California, however, individuals occur in favored localities with the large thin leaves of the Washington and Oregon plant, while near them will be found others with the narrow coriaceous leaves of the more common California form. On the western slope of the Sierra Nevada Mountains the plants are shrubby, with slender virgate branchlets often covered with bright red bark (*R. rubra*, Greene, *Pittonia*, i. 68), and rather thin narrow leaves. This extreme form passes on the one hand into the broad-leaved form of the north, and on the other into that of the California-coast region. In the dry climate of the region north and south of the Mexican boundary the branchlets and under surface of the leaves are densely coated with short fine pale tomentum.

[3] *Rhamnus Purshiana* is also known in some parts of the country as Bitter Bark, Shittim-wood, Wahoo, and Bearwood.

tinged with red, the thin sapwood being lighter colored. The specific gravity of the absolutely dry wood is 0.5836, a cubic foot weighing 36.37 pounds.

The bark of *Rhamnus Purshiana* possesses the drastic properties found in that of the other species of the genus. It is a popular domestic remedy in the region where the plant grows, and under the name of *Cascara Sagrada* has been admitted into the American materia medica.[1]

In the south *Rhamnus Purshiana* gradually passes into a variety[2] in which the branchlets and leaves, especially on their lower surface, are densely coated with thick white tomentum. This is a low spreading shrub, and the only form in southern California, Arizona, and Mexico, occurring also occasionally in central California.[3]

Rhamnus Purshiana was discovered in Montana on the banks of a tributary of the Columbia in 1805 or 1806, by the members of the first North American transcontinental exploring expedition under command of Lewis and Clark. It was first noticed on the coast of California in 1816 by the Russian naturalist Eschscholtz.[4] *Rhamnus Purshiana* has been cultivated in the Arnold Arboretum since the year 1873, and is sometimes found in its different forms in European botanic gardens. It is only precariously hardy in New England.[5]

The specific name given to it by De Candolle commemorates the botanical labors of Frederick Pursh,[6] who first described this plant.

[1] *Cascara Sagrada* has proved valuable as a tonic laxative, and is now generally used in the United States and in some European countries, the annual consumption of the crude drug being estimated at 500,000 pounds. It is employed in decoctions, tinctures, fluid extracts, and cordials (Stillé & Maisch, *Nat. Dispens.* ed. 2, 659. — Johnson, *Man. Med. Bot. N. Am.* 122. — Maisch, *Organic Mat. Med.* 194. — Parke, Davis & Co. *Organic Mat. Med.* ed. 2, 44. — *Pharmacology of the Newer Materia Medica*, Part 3, January, 1890, f. 1–3, where will be found a detailed account of the drug and its action).

[2] *Rhamnus Purshiana*, var. *tomentella*, Mary K. Brandegee, *Zoë*, i. 244.

R. tomentella, Bentham, *Pl. Hartweg.* 303. — Seemann, *Bot. Herald*, 275. — Walpers, *Ann.* ii. 267.

Frangula Californica, var. *tomentella*, Gray, *Pl. Wright.* ii. 28 (*Smithsonian Contrib.* vi.). — Torrey, *Pacific R. R. Rep.* iv. 74; vii. 9.

R. Californica, var. *tomentella*, Brewer & Watson, *Bot. Cal.* i. 101. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 41. — Trelease, *Trans. St. Louis Acad.* v. 367. — H. H. Rusby, *Druggists' Bull.* iv. 338, f. 4, 5, 10.

R. Californica, Hemsley, *Bot. Biol. Am. Cent.* i. 197.

[3] Broad-leaved forms of this variety, with the same hoary tomentum, collected by Brandegee in Lake and Colusa counties, serve to unite it with the broad-leaved glabrous form of the northwest-coast region.

[4] Johann Friedrich (Iwan Iwanowitsch) Eschscholtz (1793–1831) was born in Dorpat. He accompanied Captain Kotzebue as surgeon and naturalist in the ship Ruric, on the voyage of discovery in the Pacific Ocean which he made between 1815 and 1818, under the auspices of Count Romanzoff, passing the month of September, 1816, in the neighborhood of the Bay of San Francisco, where he discovered a number of plants afterwards described by him in the Memoirs of the Academy of St. Petersburg, and in *Linnæa* by his companion, the botanist and poet, Adelbert von Chamisso, the author of *Peter Schlemihl*. On his return to Russia Eschscholtz was appointed professor of medicine and director of the Museum of Zoölogy in the University of Dorpat, to which he presented his collection. In 1823 he accompanied Kotzebue in a second voyage of discovery, publishing its scientific results in London in 1826. Eschscholtz was the author of numerous works upon zoölogy, including the description of the animals in the recital of Kotzebue's second voyage. *Eschscholtzia*, the so-called California Poppy, now one of the most familiar and beautiful of garden annuals, commemorates his connection with the botany of the Pacific coast.

[5] In 1838 Rafinesque found the tree which he described as *Perfonon laurifolium* in Bartram's Botanic Garden near Philadelphia. It was a native of the mountains of Oregon, and was then twenty feet high. The description leaves little doubt of the identity of this plant with *Rhamnus Purshiana*. Its size, when Rafinesque saw it, would indicate that it had been raised from seed brought back by Lewis and Clark from the valley of the Columbia River. (*Garden and Forest*, iv. 76.)

[6] Frederick Pursh (1774–1820) was born in Tobolsk, in Siberia, of German parentage. He was educated in Dresden, and emigrated to America in 1799, establishing himself in Philadelphia, where for three years he served as gardener to William Hamilton, whose gardens were at that time the richest and most famous in America. Pursh then devoted several years to traveling in eastern North America and the West Indies for the purpose of studying the plants of the country, the object, he tells us, that brought him to America. In 1812 he carried his collections to London, where two years later he published his *Flora Americæ Septentrionalis*, in which were included the plants discovered between 1804 and 1806 by Lewis and Clark on their transcontinental journey. Pursh afterwards settled in Canada with the intention of continuing his studies of the North American flora, but died in Montreal before publishing any other work of importance.

EXPLANATION OF THE PLATES.

Plate LXII. Rhamnus Purshiana.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a pistil, the calyx removed and displayed, enlarged.
4. A fruiting branch, natural size.
5. Cross section of a fruit, enlarged.
6. Vertical section of a nutlet, enlarged.
7. An embryo, much magnified.

Plate LXIII. Rhamnus Purshiana.

1. A fruiting branch, natural size (Oregon form).
2. A fruiting branch, natural size (var. *tomentella*).
3. A flowering branch, natural size (mountain form).
4. Vertical section of a flower, enlarged (mountain form).
5. A petal of the same displayed, enlarged.
6. Front and rear view of a stamen of the same, enlarged.
7. Cross section of a fruit, enlarged (Oregon form).
8. A nutlet divided transversely, enlarged.
9. A seed, enlarged.
10. An embryo, enlarged.
11. A winter-bud, natural size.

C E. Faxon del. *Picart fr sc.*

RHAMNUS PURSHIANA, D C.

A. Riocreux direx.t *Imp R. Lanieur. Paris*

C.E Faxon del

Picart fr. sc.

RHAMNUS PURSHIANA, D C.

A Riocreux direx t

Imp. R. Taneur, Paris.

CEANOTHUS.

FLOWERS perfect; calyx 5-lobed, the lobes valvate in æstivation; inflexed; petals 5, inserted under the margin of the disk, unguiculate, wide-spreading; ovary immersed in and more or less adnate to the disk. Fruit drupaceous, 3-coccous.

Ceanothus, Linnæus, *Act. Ups.* i. 77; *Gen.* ed. 4, 414. — A. L. de Jussieu, *Gen.* 380. — Brongniart, *Mém. Rhamnées*, 62. — Endlicher, *Gen.* 1098. — Meisner, *Gen.* 70. — Gray, *Gen. Ill.* ii. 181. — Bentham & Hooker, *Gen.* i. 378. — Baillon, *Hist. Pl.* vi. 80.

Paliurus, Adanson, *Fam. Pl.* ii. 304 (in part).

Forrestia, Rafinesque, *N. Y. Med. Rep.* hex. 2, iii. 422, v. 351.

Small trees or shrubs, sometimes prostrate, with flexible, often angled, unarmed, or rigid terete spinescent branches. Leaves alternate or rarely opposite, petioled, coriaceous or subcoriaceous, entire, serrate, spinulose-dentate, or glandular-ciliate, glabrous, canescent-pubescent, or densely tomentose on the lower surface, triple-veined from the base or pinnately veined, deciduous or persistent; stipules slender, membranaceous and caducous, or thick and corky at the base with deciduous tips. Flowers produced in umbel-like fascicles aggregated in dense or prolonged terminal or axillary thyrsoid cymes or panicles, blue or white, often fragrant. Pedicels colored. Calyx colored, with a turbinate or hemispherical tube and triangular membranaceous petaloid lobes, deciduous by a circumscissile line. Disk fleshy, thickened above, filling the tube of the calyx. Petals alternate with and much longer than the calyx-lobes, exserted, spreading or reflexed, deciduous, the long limb enfolded round the stamens in æstivation. Stamens five, inserted with and opposite to the petals, often persistent; filaments filiform, spreading; anthers didymous or four-lobed, introrse, two-celled, the cells opening longitudinally. Ovary three-celled, sometimes three-angled, the angles often surmounted by a fleshy gland persistent in the fruit; styles short, united below; stigmas introrse or terminal; ovules solitary, erect from the base of the cell, anatropous, the raphe next the axis, the micropyle inferior. Fruit subglobose, three-lobed, supported on the base of the persistent and commonly adnate calyx; epicarp thin and soon becoming dry, dehiscent into three crustaceous or cartilaginous longitudinally two-valved cocci. Seed erect, obovate-lenticular, with a broad basal excrescence surrounding the hilum; testa thin, crustaceous; raphe ventral; albumen fleshy. Embryo axile; cotyledons oval or obovate; radicle very short, next the hilum.[1]

The genus Ceanothus is confined to the temperate and warmer regions of North America. About thirty species are distinguished,[2] the largest number belonging to California. Here Ceanothus is one of the prominent and striking features of the mountain and foothill vegetation, especially on the ranges of the coast region south of the Bay of San Francisco, where many species with showy flowers are aggregated, and in the arid southern deserts, where species with interlocking branches terminating in long rigid spines form impenetrable thickets often of great extent.[3] Two species are widely distributed in the eastern part of the continent[4] from Manitoba to Texas, and from the ocean to the base of the Rocky Mountains; and two others occur in the maritime region of the southern Atlantic states.[5] The

[1] Dr. Parry first recorded (*Proc. Davenport Acad.* v. 164) the fact that the nutlets of many species when relieved from the disk expel the smooth-coated seed through the ventral slit with considerable force. To this provision, which serves to protect the ripe seed from omnivorous animals and insures its reaching the surface of the ground, he ascribes the gregarious habit peculiarly characteristic of many of the Californian species.

[2] Torrey & Gray, *Fl. N. Am.* i. 264. — Watson, *Proc. Am. Acad.* x. 333. — Trelease, *Proc. Cal. Acad.* ser. 2, i. 106. — Parry, *Proc. Davenport Acad.* v. 162.

[3] A number of forms of Ceanothus now believed to be hybrids have been noticed in California (Trelease, *Garden and Forest*, i. 7; *Proc. Cal. Acad.* ser. 2, i. 116. — Parry, *Proc. Davenport Acad.* v. 170).

[4] Watson & Coulter, *Gray's Man.* ed. 6, 112.

[5] Chapman, *Fl.* 74.

remainder are peculiar to the Rocky-mountain and Pacific-coast region of the continent, ranging from British Columbia to Mexico,[1] where five or six species at least have been detected, and to Guatemala.

Ceanothus possesses few useful properties. The leaves, bark, and roots are astringent and tonic. The roots of *Ceanothus Americanus* are dark red, and yield a cinnamon-colored dye; and the leaves of this species, which is still popularly known in some parts of the country as New Jersey Tea, are said to have been used as a substitute for tea-leaves during the Revolutionary War. The root was used by the Cherokee Indians as a remedy for syphilis, and a decoction of the seeds and leaves has been employed for dysentery,[2] and in the treatment of ulceration of the mouth and throat. Many of the species are beautiful garden plants.[3]

Ceanothus is formed from *κεάνωθος*, a name given to some spiny plant by Theophrastus and transferred by Linnæus to this genus.

[1] Hemsley, *Bot. Biol. Am. Cent.* i. 199.

[2] *U. S. Dispens.* ed. 14, 1609. — Stillé & Maisch, *Nat. Dispens.* ed. 2, 373. — Maisch, *Organic Mat. Med.* 98.

[3] Loudon, *Arb. Brit.* ii. 539. — Decaisne & Naudin, *Manuel de l'Amateur des Jardins*, iii. 81. — Nicholson, *Dict. Gard.* — Naudin, *Manuel de l'Acclimateur*, 193.

Much attention has been paid for many years in the gardens of France to the improvement of Ceanothus by selection and hybridization. *Ceanothus Gloire de Versailles* (*Rev. Hort.* 1868, 388; 1889, 99), a seedling of the Mexican *C. azureus* (Desfontaines, *Cat.* 1815, 232), obtained by Monsieur Christern of Versailles, is a plant of great ornamental value wherever the climate will permit of its being grown in the open air. A race of dwarf hardy Ceanothus, with abundant showy blue, white, or rose-colored flowers, has been produced by crossing the eastern *C. Americanus* with *C. azureus*, and perhaps with some of the Californian species (Jaume St. Hilaire, *Flore et Pomone*, vi. t. 525. — *Rev. Hort.* 1875, 30).

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Branchlets conspicuously angled; leaves slightly pubescent on the lower surface . . 1. C. THYRSIFLORUS.

Branchlets slightly angled; leaves densely tomentose on the lower surface . . . . 2. C. VELUTINUS, var. ARBOREUS.

CEANOTHUS THYRSIFLORUS.

Blue Myrtle. California Lilac.

BRANCHLETS conspicuously angled. Inflorescence compound on leafy branches. Leaves alternate, prominently 3-ribbed, minutely glandular-serrate.

Ceanothus thyrsiflorus, Eschscholtz, *Mém. Acad. Sci. St. Pétersbourg*, x. 285. — Hooker, *Fl. Bor.-Am.* i. 125. — Don, *Gen. Syst.* ii. 37. — Hooker & Arnott, *Bot. Voy. Beechey*, 136, 328. — Torrey & Gray, *Fl. N. Am.* i. 266. — Dietrich, *Syn.* i. 813. — Loudon, *Arb. Brit.* ii. 540. — Lindley, *Bot. Reg.* xxx. t. 38. — Nuttall, *Sylva*, ii. 44, t. 57. — Bentham, *Bot. Voy. Sulphur*, 10; *Pl. Hartweg.* 302. — *Ann. Gand.* iii. 11, t. 107. — Torrey, *Pacific R. R. Rep.* iv. 74; *Bot. Mex. Bound. Surv.* 45; *Bot. Wilkes Explor. Exped.* 263. — Newberry, *Pacific R. R. Rep.* vi. 69. — Cooper, *Pacific R. R. Rep.* xii. 57. — Koch, *Dendr.* i. 621. — Watson, *Proc. Am. Acad.* x. 334. — Brewer & Watson, *Bot. Cal.* i. 102. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 41. — Parry, *Proc. Davenport Acad.* v. 170. — Trelease, *Proc. Cal. Acad.* ser. 2, 108.

A small tree, rising sometimes to the height of thirty-five feet, with a trunk twelve or fourteen inches in diameter, dividing, five or six feet from the ground, into many wide-spreading slender branches; or more often a tall or low shrub. The bark of the trunk is thin with a bright red-brown surface separating into thin narrow appressed scales. The branchlets are conspicuously angled, pale yellow-green, and slightly pubescent when they first appear, but soon become glabrous. The leaves are persistent, oblong or oblong-ovate, smooth and lustrous on the upper surface, and paler and slightly pubescent beneath, especially along the principal veins; they are an inch or an inch and a half long and half an inch to an inch broad, with prominent orange-colored veins, and are borne on stout petioles from a third to half an inch in length. The stipules are membranaceous, acute, and early deciduous. The fragrant blue or white flowers appear in early spring, and are arranged in small pedunculate corymbs produced from the axils of minute deciduous bracts and collected into slender rather loose thyrsoid clusters two or three inches long, terminating long leafy pedunculate branchlets of the year; these spring from the axils of upper leaves or of small scarious bracts, and are usually surmounted by the terminal leafy shoot of the branch. The fruit, which ripens from July to September, is black at maturity and is not crested. The seed is a line long, with a smooth dark brown or black coat.

Ceanothus thyrsiflorus belongs to the mountainous region of western California, where it is widely distributed through the coast ranges from Mendocino County in the north to the valley of the San Luis Rey River. It is usually found on shady hillsides growing on the borders of the forest, often in the neighborhood of streams. It attains its greatest size[1] on the hills overlooking the swamps of the Noyo River in Mendocino County, where it is associated with the Redwood, the Douglas Fir, the Buckthorn, and various Willows and Oaks; and in the Redwood forests of the Santa Cruz Mountains. Towards the southern limit of its range it is reduced to a low shrub,[2] often flowering and ripening its fruit on the wind-swept shores of the ocean when only a foot or two high.

The wood of *Ceanothus thyrsiflorus* is close-grained and rather soft, with obscure medullary rays. It is light brown, with thin darker colored sapwood, and when absolutely dry has a specific gravity of 0.5750, a cubic foot weighing 35.83 pounds.

Ceanothus thyrsiflorus was discovered in 1816 by Eschscholtz, and was introduced into English

[1] As noticed by T. S. Brandegee.

[2] *Ceanothus thyrsiflorus* shows a tendency to cross with other species and produce natural hybrids. Several of these have been noticed; and Dr. Parry, who long studied the Californian Ceanothus in the field, reached the conclusion (*Proc. Davenport Acad.* v. 170) that *C. Lobbianus* (Hooker, *Bot. Mag.* t. 4810) and *C. Veitchianus* (Hooker, *Bot. Mag.* t. 5127) are hybrids of this species.

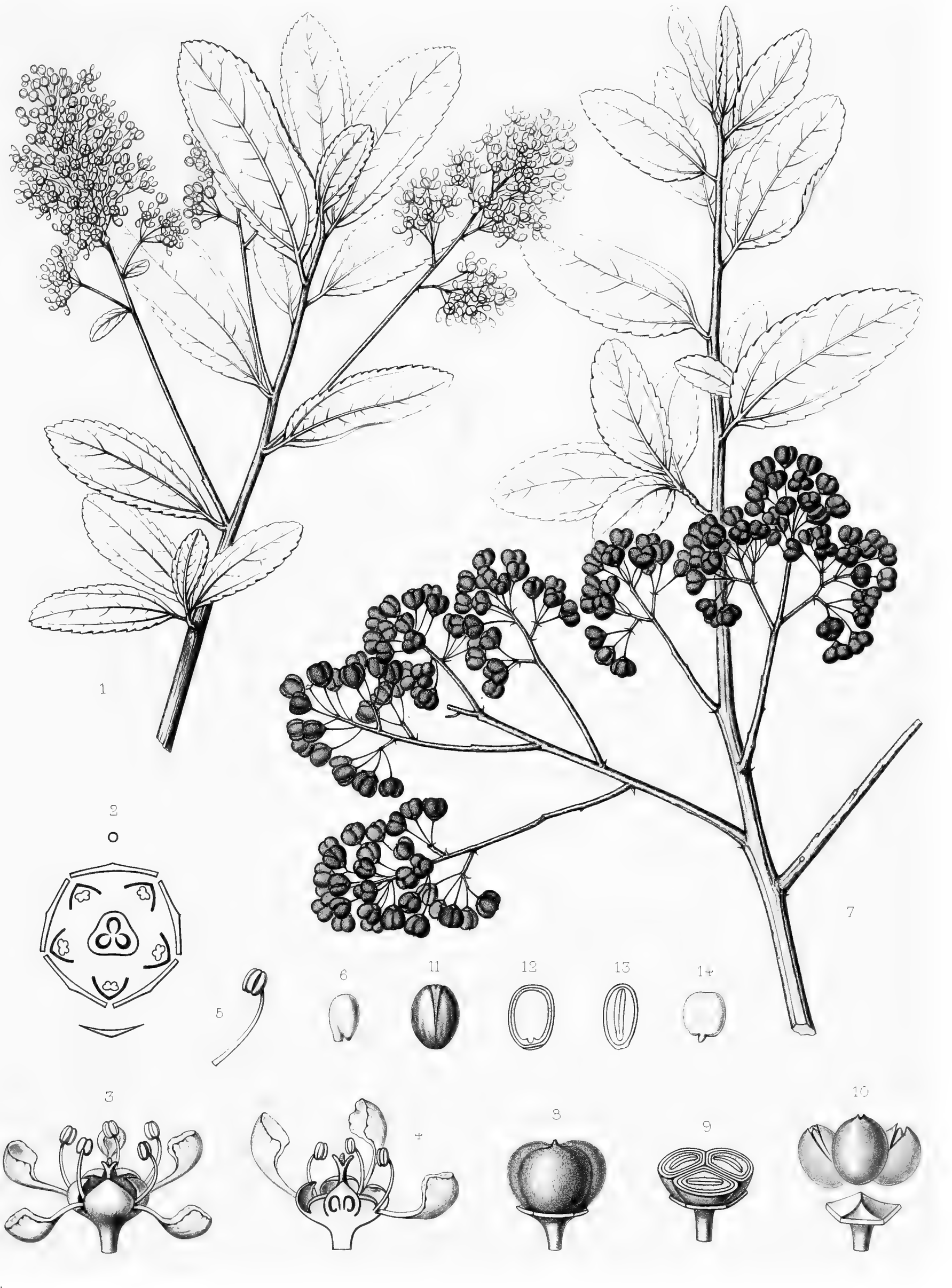
gardens in 1837 by Richard Brinsley Hinds,[1] who sent seeds to the Horticultural Society of London. *Ceanothus thyrsiflorus*, like the other Californian species, is not hardy in the eastern states; and in Europe it is now rarely cultivated, having been replaced by garden varieties and hybrids with more showy flowers.

[1] Richard Brinsley Hinds; a surgeon in the British navy, is best known from his association with the voyage of discovery of the Sulphur under command of Captain Sir Edward Belcher. The Sulphur was in the Bay of San Francisco in the autumn of 1837, and two years later visited San Diego. The botanical discoveries of the voyage were published by Dr. Hinds and Mr. Bentham in 1844 in a work entitled *The Botany of the Voyage of H. M. S. Sulphur*. *Hindsia*, a genus of Brazilian plants established by Bentham, recalls his name to botanists.

EXPLANATION OF THE PLATE.

PLATE LXIV. CEANOTHUS THYRSIFLORUS.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. A fruit, enlarged.
9. Cross section of a fruit, enlarged.
10. A fruit, the nutlets detached, enlarged.
11. A nutlet, enlarged.
12. Vertical section of a nutlet, enlarged.
13. Vertical section of a seed, enlarged.
14. An embryo, much magnified.



C. E. Faxon del. Picart fr sc.

CEANOTHUS THYRSIFLORUS, Eschsch.

A. Riocreux direx.t Imp.R. Taneur. Paris

CEANOTHUS VELUTINUS, var. ARBOREUS.

BRANCHES slightly angled. Inflorescence compound on more or less leafy branches. Leaves alternate, glandular-crenate, densely tomentose on the lower surface.

Ceanothus velutinus, var. **arboreus**, Sargent, *Garden and Forest*, ii. 364.

C. sorediatus, Lyon, *Bot. Gazette*, xi. 204, 333 (not Hooker & Arnott).

C. arboreus, Greene, *Bull. Cal. Acad.* ii. 144. — Trelease, *Proc. Cal. Acad.* ser. 2, i. 110. — Brandegee, *Proc. Cal. Acad.* ser. 2, i. 208. — Parry, *Proc. Davenport Acad.* v. 169.

A small round-headed tree, twenty to twenty-five feet high, with a straight trunk six to ten inches in diameter, dividing, four or five feet from the ground, into many stout spreading branches; or often a shrub. The bark of the trunk is dark brown, an eighth of an inch thick, and broken into small square plates which separate into thickish scales. The branchlets when they first appear are slightly angled, pale brown, and covered with short dense tomentum. In their second season they are terete, nearly glabrous, roughened with scattered lenticular excrescences, and marked with large elevated leaf-scars. The leaves are broadly ovate or elliptical, acute, conspicuously glandular-crenate, dark green and softly puberulent on the upper surface, and pale and densely tomentose on the lower; they are two and a half to four inches long and an inch to two and a half inches broad, with prominent veins, and are borne on stout pubescent petioles half an inch to nearly an inch in length. The stipules are subulate from a broad triangular base, a quarter of an inch long, and early deciduous. The pale blue flowers, which open in July and August, are borne on slender hairy pedicels half an inch to an inch in length, produced from the axils of large scarious caducous bracts; they are arranged in ample compound densely hoary-pubescent thyrsoidal clusters three or four inches long and one and a half to two inches broad, on lateral leafy or naked axillary peduncles which appear at the extremities of young branches. The fruit is a quarter of an inch across and black at maturity.

Ceanothus velutinus, var. *arboreus*, inhabits Santa Catalina, Santa Cruz, and Santa Rosa in the Santa Barbara group of islands off the coast of California. It reaches its best development on the northern slopes of Santa Cruz, where it is abundant at the highest elevation. On the other islands it is usually a bush branching from the ground with many slender stems. The insular plant appears to pass into *C. velutinus*[1] of the mainland, a species widely distributed from northern California to the Columbia River, and in the region east of the Sierra Nevada Mountains, differing from it in habit, in its pubescent shoots, in the more constant pubescence of the leaves, in its long slender pedicels, and in the color of its flowers.

The wood of *Ceanothus velutinus*, var. *arboreus*, is heavy, hard, and close-grained, with thin very obscure medullary rays. The layers of annual growth are clearly marked with broad bands of minute open ducts, having irregular groups of ducts between them. Its color is light reddish brown, while the sapwood, composed of seven or eight layers of annual growth, is nearly white. The specific gravity of the absolutely dry wood is 0.7781, a cubic foot weighing 48.49 pounds.[2]

This handsome tree was discovered in 1835 on Santa Catalina by Thomas Nuttall.[3]

[1] *Ceanothus velutinus*, Douglas; Hooker, *Fl. Bor.-Am.* i. 125, t. 45; *Bot. Mag.* t. 5165. — Torrey & Gray, *Fl. N. Am.* i. 265, 686. — Watson, *Proc. Am. Acad.* x. 334. — Brewer & Watson, *Bot. Cal.* i. 102. — Trelease, *Proc. Cal. Acad.* ser. 2, i. 110. — Parry, *Proc. Davenport Acad.* v. 169.

[2] *Garden and Forest*, iii. 332.

[3] Trelease, *l. c.* 115.

EXPLANATION OF THE PLATE.

PLATE LXV. CEANOTHUS VELUTINUS, var. ARBOREUS.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branch, natural size.
5. Vertical section of a fruit, enlarged.
6. A seed, enlarged.
7. An embryo, much magnified.

C. E. Faxon del. *Picart fr. sc.*

CEANOTHUS VELUTINUS, Var. ARBOREUS, Sargt.

A. Riocreux direx.t *Imp R. Taneur. Paris*

COLUBRINA.

Flowers perfect; calyx 5-lobed, the lobes valvate in æstivation; petals 5, inserted under the margin of the disk; ovary surrounded by and confluent with the disk, 3-celled. Fruit drupaceous, 3-lobed, 3-coccous.

Colubrina, Brongniart, *Mém. Rhamnées*, 61; *Ann. Sci. Nat.* x. 368. — Endlicher, *Gen.* 1098. — Meisner, *Gen.* 70. — Bentham & Hooker, *Gen.* i. 379. — Baillon, *Hist. Pl.* vi. 77.

Ceanothus, Linnæus, *Act. Ups.* i. 77; *Gen.* ed. 4, 414 (in part). — A. L. de Jussieu, *Gen.* 380 (in part).
Paliurus, Adanson, *Fam. Pl.* ii. 304 (in part).
Marcorella, Rafinesque, *Sylva Tellur.* 31.
Diplisca, Rafinesque, *Sylva Tellur.* 31.

Trees or shrubs, with terete, glabrous or pubescent, sometimes sarmentose branches. Leaves alternate, petioled, oblong-cordate or lanceolate, entire or crenate, pinnately veined or triple-veined from the base, often ferrugineo-tomentose on the lower surface; stipules minute, deciduous. Flowers axillary in contracted few-flowered cymes or fascicles, yellow or greenish yellow. Calyx-tube hemispherical, persistent, the lobes spreading, triangular-ovate, conspicuously keeled on the inner surface, deciduous by a circumscissile line. Disk fleshy, filling the tube of the calyx, annular, five-angled or indistinctly five or ten-lobed. Petals alternate with and shorter than the lobes of the calyx, cucullate, unguiculate, enfolding the stamens. Stamens five, opposite to and inserted with the petals; filaments slender, incurved; anthers ovate, introrse, two-celled, the contiguous cells opening longitudinally. Ovary subglobose, immersed in the disk, contracted into a slender three-lobed style, the obtuse lobes stigmatic on their inner face; ovules solitary, erect from the base of the cell, anatropous; the raphe ventral; the micropyle inferior. Fruit subglobose, supported on the adnate base of the persistent calyx-tube; epicarp dry and thin or fleshy, septicidally dehiscent into three membranaceous crustaceous or cartilaginous cocci opening longitudinally, or two-valved at the apex. Seed erect, broadly obovoid, compressed, three-angled; testa coriaceous, smooth, and shining; albumen thick and fleshy. Embryo axile; cotyledons orbicular, flat or incurved, thin or fleshy; radicle short, inferior, next the hilum.

The genus Colubrina belongs principally to the warmer and tropical parts of America, although one species[1] is widely distributed in the tropics of the Old World, and two others are found in India.[2] About a dozen species spread in America from western Texas, where two shrubby forms[3] occur, through Mexico[4] to Brazil,[5] and through the West India Islands[6] to the shores of southern Florida, which are reached by the arborescent *C. reclinata* and the shrubby *C. colubrina*.[7]

Colubrina has few properties useful to man. The wood of several of the species is hard, heavy, and strong, and the bark and leaves are bitter and astringent. *C. Fermentum*, a native of Guiana, is said to owe its name to the fact that the bark is used to ferment the juice of the Sugar-cane.[8] Accord-

[1] *Colubrina Asiatica*, Brongniart, *Ann. Sci. Nat.* x. 369. — Wight & Arnott, *Prodr.* 166. — Thwaites, *Enum. Pl. Zeylan.* 75. — Gray, *Bot. N. Pacific Explor. Exped.* i. 277. — Oliver, *Fl. Trop. Afr.* i. 383. — Miquel, *Fl. Ind. Bat.* i. 648. — Seemann, *Fl. Vit.* 42. — Hooker f. *Fl. Brit. Ind.* i. 642. — Bentham, *Fl. Austral.* i. 413. — Hillebrand, *Fl. Haw. Is.* 80.

Ceanothus Asiaticus, Linnæus, *Spec.* 196.

[2] Hooker f. *l. c.*

[3] *C. Texensis*, Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 169 (*Pl. Lindheim.* ii.). — Walpers, *Ann.* ii. 268. — Trelease, *Trans. St. Louis Acad.* v. 368.

C. Greggii, Watson, *Proc. Am. Acad.* xvii. 336.

[4] Hemsley, *Bot. Biol. Am. Cent.* i. 200. — Watson, *Proc. Am. Acad.* xxiv. 44.

[5] Reissek, *Martius Fl. Brasil.* xi., i. 98, t. 23, t. 25, f. 2, 3.

[6] Grisebach, *Fl. Brit. W. Ind.* 100; *Cat. Pl. Cub.* 34.

[7] *Rhamnus colubrina*, Linnæus, *Spec.* ed. 2, 280.

Ceanothus colubrinus, Lamarck, *Ill.* ii. 90.

Colubrina ferruginosa, Brongniart, *Mém. Rhamnées*, 62, t. 4, f. 3. — Grisebach, *Fl. Brit. W. Ind.* 100. — Trelease, *l. c.* 369.

C. Americana, Nuttall, *Sylva*, ii. 47, t. 58. — Chapman, *Fl.* 74.

[8] Endlicher, *Enchirid.* 583.

ing to Seemann,[1] the natives of the Feejee Islands use the powdered bark and leaves of *C. Asiatica* to clean the hair and to destroy vermin.

The name Colubrina, from *coluber*, a serpent, was first used by Linnæus as the specific name of the West Indian and Floridian plant, afterwards made the type of the genus. It probably was given to it on account of the peculiar twisting of the deep furrows of the stem which produces in some of the species an effect resembling that of a mass of intertwined serpents.

[1] *Fl. Vit.* 42.

COLUBRINA RECLINATA.

Naked Wood.

INFLORESCENCE pedunculate. Fruit dry; nutlets crustaceous, 2-valved at the apex; cotyledons flat and fleshy. Leaves persistent, glabrate at maturity.

Colubrina reclinata, Brongniart, *Ann. Sci. Nat.* x. 364. — Don, *Gen. Syst.* ii. 36. — Richard, *Fl. Cub.* ii. 147. — Grisebach, *Fl. Brit. W. Ind.* 101; *Cat. Pl. Cub.* 34. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 40. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 41. — Trelease, *Trans. St. Louis Acad.* v. 368.

Ceanothus reclinatus, L'Héritier, *Sert. Ang.* 4. — De Candolle, *Prodr.* ii. 31. — Macfadyen, *Fl. Jam.* 211.

Rhamnus elliptica, Swartz, *Prodr.* 50; *Fl. Ind. Occ.* i. 497. — Aiton, *Hort. Kew.* i. 265. — Willdenow, *Spec.* i. 1098. — Roemer & Schultes, *Syst.* v. 288.

Zizyphus Domingensis, *Nouveau Duhamel*, iii. 56.

Diplisca elliptica, Rafinesque, *Sylva Tellur.* 31.

A tree, growing in Florida to the height of fifty or sixty feet, with a stout trunk three or four feet in diameter, divided, when fully grown, by many irregular deep furrows multiplying and spreading in all directions. The bark is thin and orange-brown, exfoliating with large papery scales.[1] The branchlets when they first appear are slightly angled, puberulent, and reddish brown, but soon become glabrate, and in the second season are nearly terete, with gray or light brown bark marked with numerous small light-colored lenticels. The leaves are elliptical, ovate or lanceolate, usually contracted at the apex into a blunt point, entire, and furnished with two conspicuous marginal glands on the wedge-shaped or sometimes somewhat rounded base. When they first unfold they are glabrous or faintly puberulent on the lower surface along the principal veins, and are then thin and membranaceous; they become subcoriaceous before reaching maturity, and are two and a half to three inches long, an inch and a half to nearly two inches broad, with slender petioles half an inch long and rather stout midribs grooved on the upper surface, and arcuate primary veins. In Florida they appear in early summer, and are then light green on the upper and pale on the lower surface, becoming yellow-green at maturity and remaining on the branches until their second year. The clusters of flowers, which are rather shorter than the petioles, appear on the shoots of the year; they are at first pubescent but soon become glabrate. The fruit, which ripens late in the autumn, is a quarter of an inch across and dark orange-red, and is borne on pedicels half an inch in length, or often a little longer.

Colubrina reclinata is confined in Florida to Umbrella Key, to the north end of Key Largo, and to a few of the small islands south of Elliott's Key. It inhabits Jamaica, St. Lucia, St. Vincent, Cuba, Hayti, Ste. Croix, and the Virgin and Bahama groups. In Florida it attains its greatest size on Umbrella Key, where it forms a forest of considerable extent.

The wood of *Colubrina reclinata* is heavy, hard, and very strong, although ultimately brittle, with a satiny surface susceptible of receiving a good polish. It contains many small open ducts and numerous thin medullary rays, and is dark brown tinged with yellow, the thin sapwood, consisting of eight or ten layers of annual growth, being light yellow. The specific gravity of the absolutely dry wood is 0.8208, a cubic foot weighing 51.15 pounds. According to Baron Eggers,[2] the leaves of this tree are sometimes used in Ste. Croix and the Virgin Islands in the preparation of a stomachic beverage.

The earliest description of *Colubrina reclinata*, and the only figure of it which has been pub-

[1] On the side of the deep furrows where the bark does not scale off, the edges of forty or fifty of the layers of papery bark can sometimes be counted.

[2] *Bull. U. S. Nat. Mus.* No. 13, 40.

lished, appears in Patrick Browne's *Natural History of Jamaica*.[1] It was first detected in Florida in 1881 by Mr. A. H. Curtiss.[2]

Colubrina reclinata, according to Aiton,[3] was cultivated in the Chelsea Botanic Garden in 1758 by Philip Miller.[4]

[1] *Rhamnus arborescens minor foliis ovatis venosis, pedunculis umbellulatis alaribus, fructibus sphericis*, 172, t. 29, f. 2.

[2] Allen Hiram Curtiss, a native of Central Square, Oswego County, New York, was born in 1845, and moved to Virginia in 1862 and to Florida in 1875. Mr. Curtiss has made large and valuable botanical collections in southern Virginia and in Florida, especially in the extreme southern part of the State, which he has visited several times as an agent of the United States government and of the American Museum of Natural History, and in which he has found many plants, including a number of tropical trees, not known in the territory of the United States before his time. His sets of dried plants are found in the principal herbaria of the United States and of Europe.

[3] *Hort. Kew.* i. 265.

[4] See i. 38.

EXPLANATION OF THE PLATE.

PLATE LXVI. COLUBRINA RECLINATA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. An ovule, much magnified.
6. A fruiting branch, natural size.
7. Vertical section of a fruit, enlarged.
8. A fruit, cut transversely.
9. A nutlet, enlarged.
10. A seed, enlarged.
11. An embryo, much magnified.

C. E. Faxon del. *Picart fr sc.*

COLUBRINA RECLINATA, Brong.

A. Riocreux direx.t *Imp R. Taneur Paris*

ÆSCULUS.

Flowers polygamo-monœcious; calyx 5-lobed, the lobes imbricated in æstivation, unequal; petals 4 or 5, imbricated in æstivation, unequal, hypogynous, inappendiculate; ovary sessile, 3-celled; ovules 2, heterotropous. Fruit a coriaceous capsule, 3-celled and loculicidally 3-valved, the cells by abortion 1-seeded. Leaves opposite, digitate, destitute of stipules.

Æsculus, Linnæus, *Gen.* 109. — A. L. de Jussieu, *Gen.* 251. — Endlicher, *Gen.* 1075. — Meisner, *Gen.* 51. — Gray, *Gen. Ill.* ii. 205. — Bentham & Hooker, *Gen.* i. 398. — Baillon, *Hist. Pl.* v. 424.
Hippocastanum, Adanson, *Fam. Pl.* ii. 383.
Pavia, Poiret, *Lam. Dict.* v. 93.
Macrothyrsus, Spach, *Ann. Sci. Nat.* ser. 2, ii. 61.
Calothyrsus, Spach, *Ann. Sci. Nat.* ser. 2, ii. 62.
Billia, Peyritsch, *Bot. Zeit.* xvi. 153. — Baillon, *Hist. Pl.* v. 424.
Putzeysia, Planchon & Linden, *Cat.* 1857.

Trees or shrubs, with stout terete branchlets conspicuously marked with triangular leaf-scars, fetid bark, thick fleshy roots, and large scaly winter-buds, the outer scales sometimes coated with resin, the inner bract-like, accrescent with the young shoots, and often brightly colored. Leaves opposite, digitately compound, deciduous; leaflets five to nine, rarely three (Billia), lanceolate or ovate, serrate, pinnately veined. Flowers showy, white, red, or pale yellow, racemose or nearly unilateral on the branches of large terminal thyrsi or panicles appearing later than the leaves, only those near the base of the branches of the inflorescence perfect and fertile. Pedicels from the axils of minute caducous bracts, jointed. Calyx campanulate or tubular, mostly oblique or posteriorly gibbous at the base. Disk hypogynous, annular, depressed, lobed, more or less gibbous posteriorly. Petals alternate with the lobes of the calyx, deciduous, the anterior one often abortive, unguiculate, the margins of the claw commonly involute. Stamens six to eight, rarely five, generally seven, inserted on the disk, free, unequal; filaments filiform; anthers elliptical, glandular-apiculate, attached on the back below the middle, introrse, two-celled, the contiguous cells opening longitudinally. Ovary sessile, oblong or lanceolate, three-celled, echinate or glabrous; rudimentary in the sterile flower; style slender, elongated, generally more or less curved; stigma terminal, entire, mostly acute; ovules two in each cell, borne on the middle of its inner angle, amphitropous, the upper ascending, the micropyle inferior; the lower pendulous, the micropyle superior. Fruit echinate, roughened, or smooth, three-celled, the cells one-seeded by abortion, or often by suppression one or two-celled and then one or two-seeded, the remnants of the abortive cells and seeds commonly visible at its maturity. Seeds destitute of albumen, round when only one is developed, or, when more than one, flattened by mutual pressure; testa coriaceous, chestnut-brown, smooth and shining, with a broad opaque light-colored hilum. Embryo filling the seed; cotyledons very thick and fleshy, often conferruminate, unequal, incurved on the short conical radicle, and remaining underground in germination; plumule conspicuously two-leaved.[1]

[1] The genus Æsculus is divided into two sections: —

Hippocastanum. Petals 5. Fruit echinate with thick valves. Primary veins of the leaflets slightly arcuate, remote.

Pavia. Petals 4. Fruit smooth with thin valves. Primary veins of the leaflets straight and less remote than in *Hippocastanum*.

The North American *Æsculus glabra* has the flowers of *Pavia* with rather thin-valved fruit which, at least when young, is echinate, and the venation of *Hippocastanum*.

The genus Æsculus is represented in the floras of the three continents of the northern hemisphere. Thirteen species are distinguished, eight of which are American. The type of the genus, *Æsculus Hippocastanum*,[1] is indigenous in the mountains of Greece. One species[2] occurs in the forests of the western Himalayas at elevations of from four to ten thousand feet above the sea-level; and another[3] in the tropical forests of the Sikkim Himalayas, of the Khasia hills, and of Assam and Burmah. *Æsculus Chinensis*[4] is widely distributed in northern China, and *Æsculus turbinata*[5] in central China and in Japan. With the exception of *Æsculus Pavia*[6] and *Æsculus parviflora*[7] of the southern United States, *Æsculus Parryi*[8] of Lower California, and two little known species with trifoliate leaves, one[9] of which inhabits southern Mexico, and the other[10] New Granada and Venezuela, all the Horse-chestnuts are arborescent, some of them growing to a large size.

Æsculus has few useful properties. The wood of all the species is soft, straight-grained, light-colored, and easily worked, and, although it decays rapidly when exposed to the action of the weather, is employed in the manufacture of many small articles, and, in the United States, in paper-making. The bark is bitter and astringent; that of *Æsculus Hippocastanum* has been used in tanning, as a substitute for cinchona in the treatment of fevers,[11] and in homœopathic remedies.[12] The roots contain a mucilaginous saponiferous matter, and it is said that those of *Æsculus Pavia* are used in Carolina as a substitute for soap.[13] The roots and the bruised branches of this and of some of the other American species emit a disagreeable odor, and their narcotic properties have caused them to be used to intoxicate fish.[14] The large farinaceous seeds of Æsculus contain a bitter principle, Esculine, which deprives them of value as food for man,[15] although they are sometimes fed to sheep, goats, and swine.

[1] Linnæus, *Spec.* 344. — De Candolle, *Prodr.* i. 597.

Although the Horse-chestnut has been cultivated in the gardens of Europe for more than three centuries, its native country was long unknown. Different authors have believed it to be a native of the Caucasus, of northern India, and of Thibet. Sibthorp noticed it on the mountains of northern Greece (Nyman, *Conspect. Fl. Europ.* 136), but it is only in recent years that Orphanides has established the fact that it is indigenous in the forests which cover these mountains. (Grisebach, *Vegetation der Erde*, French ed. i. 521, note.)

[2] *Æsculus Indica*, Colebrooke, *Wallich Cat.* No. 1188. — Brandis, *Forest Fl. Brit. Ind.* 103, t. 19. — Hooker f. *Fl. Brit. Ind.* i. 675.

Pavia Indica, Cambessedes; *Jacquemont Voyage*, iv. 31, t. 35.

The Horse-chestnut of northern India, a fine tree which grows to the height of sixty or seventy feet with a stout trunk three or four feet in diameter, is found in considerable numbers in moist shady valleys, which it enlivens in April and May with large panicles of showy flowers. It was introduced as early as 1850 into English gardens, where for many years it flowered freely. It is, however, still little known in cultivation. (*Bot. Mag.* t. 5117.)

[3] *Æsculus Punduana*, Wallich, *Cat.* No. 1189. — Hooker f. *l. c.*

Æ. Asamica, Griffith, *Journals*, i. 122.

[4] Bunge, *Enum. Pl. Chin. Bor.* 10. — Hance, *Jour. Bot.* 1870, 312. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 139.

[5] Blume, *Rumphia*, ii. 195. — Debeaux, *Fl. Shangh.* 22. — Gray, *Mem. Am. Acad.* n. ser. vi. 384. — Franchet & Savatier, *Enum. Pl. Jap.* i. 86. — Forbes & Hemsley, *l. c.*

Æ. Pavia, Thunberg, *Fl. Jap.* 154 (not Linnæus).

Æ. dissimilis, *Rumphia*, iii. 195. — Miquel, *Prol. Fl. Jap.* 257. — Franchet & Savatier, *l. c.*

Æsculus turbinata is now occasionally cultivated in the gardens of the United States and Europe, where it makes a handsome round-headed hardy tree. (André, *Rev. Hort.* 1888, 496, f. 120–124.)

[6] Linnæus, *Spec.* 344. — Watson, *Dendr. Brit.* ii. t. 120. — Guimpel, Otto & Hayne, *Abbild. Holz.* 24, t. 21. — Lindley, *Bot. Reg.* t. 993. — Watson & Coulter, *Gray's Man.* ed. 6, 116.

Pavia rubra, Lamarck, *Ill.* ii. 407, t. 273.

[7] Walter, *Fl. Car.* 128. — Chapman, *Fl.* 79.

Æ. macrostachya, Michaux, *Fl. Bor.-Am.* i. 220. — *Bot. Mag.* t. 2118.

[8] Gray, *Proc. Am. Acad.* xvii. 200. — Sargent, *Garden and Forest*, iii. 356, f. 47.

[9] *Æsculus Mexicana*, Bentham & Hooker, *Gen.* i. 398. — Hemsley, *Bot. Biol. Am. Cent.* i. 212.

Billia Hippocastanum, Peyritsch, *Bot. Zeit.* xvi. 153. — Walpers, *Ann.* vii. 624.

Putzeysia rosea, Planchon & Linden, *Cat.* 1857.

[10] *Æsculus Columbiana*, Bentham & Hooker, *l. c.*

Billia Columbiana, Planchon & Linden, *l. c.* — Triana & Planchon, *Ann. Sci. Nat.* ser. 4, xviii. 367. — Walpers, *Ann. l. c.*

[11] Zannichelli, *Lettera intorno alla Facoltà dell' Ippocastano.* — Peipers, *Diss. de cortice Hippoc.* — Turra, *Della febrifuga Facoltà dell' Ippocastano.* — Woodville, *Med. Bot.* ii. 349, t. 128. — *U. S. Dispens.* ed. 14, 1565. — Stillé & Maisch, *Nat. Dispens.* ed. 2, 712.

The oil of the Horse-chestnut has also been used as a lotion in cases of chronic gout and rheumatism, and a decoction of the leaves was once a popular remedy in the United States for whooping-cough. A seed of the Horse-chestnut carried on the person is still believed by many people in the United States to be a certain preventive of rheumatism.

[12] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 43, t. 43.

[13] Gray, *Gen. Ill.* ii. 207.

[14] Gray, *l. c.*

[15] The bitter properties contained in the cotyledons of Æsculus can be removed by repeated washings in pure water, and, were it not for the cost of the operation, they could be made in this way valuable as food for man. (See *Mémoire sur les Marrons d'Inde* by A. Baume, published in Paris in 1797.)

Flour made from the seeds has been used as a cosmetic,[1] and is said to make the best starch;[2] and it has been stated that paste made from this flour is superior to any other on account of its greater tenacity and because it is repellent to moths and other insects,[3] a quality which recommends it to book-binders. The seeds of *Æsculus Chinensis* are said by Smith[4] to be sweet, and to be thought useful by the Chinese in the treatment of limbs contracted by palsy or rheumatism. In northern India the leaves and branches are cut in large quantities for the winter fodder of cattle.[5] The Japanese employ the bark of *Æsculus turbinata* in connection with ferrous acetate and sulphates to produce a black dye.[6]

Æsculus includes some of the most ornamental trees of the north temperate zone. *Æsculus Hippocastanum* has been a favorite in gardens and parks[7] since its introduction into Europe in the middle of the sixteenth century.[8] A number of varieties with differently divided or blotched leaves, or with more or less double flowers, have been developed in cultivation,[9] but none of them equal the normal form in beauty. *Æsculus rubicunda*,[10] a probable hybrid with bright red flowers, is valued by the lovers of beautiful trees. The American species are all handsome plants in cultivation.

All species of Æsculus thrive in rich rather humid soil, and display their greatest beauty only in regions of abundant and well distributed rainfall. They can easily be raised from seed, which, however, soon loses its vitality; and the varieties may be perpetuated by grafting.

Although the Horse-chestnuts are sometimes disfigured and injured by insects,[11] they are not

[1] Baillon, *Hist. Pl.* v. 388.

[2] Parmentier, *Récherches sur les végétaux nourrissants*, 176, 218.

[3] Griffith, *Med. Bot.* 214.

[4] *Contrib. Mat. Med. China*, 5.

[5] Brandis, *Forest Fl. Brit. Ind.* 104.

[6] Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung dargestellt*, ii. 211.

[7] The symmetrical habit of the Horse-chestnut and its dense heavy head of foliage adapt it rather to formal gardens and avenues than to more picturesque landscape-plantations.

[8] The Horse-chestnut was first made known in Europe by Quakelbeen, a Flemish physician attached to the person of the famous traveler Busbeck, ambassador of the Archduke Ferdinand I. at the court of Solyman II., who, in 1557, sent a branch and fruit from Constantinople to Matthiolus, the commentator of Dioscorides (Lib. i. 184, f. ed. 1674. — Sprengel, *Hist. Rei Herb.* i. 340). The seed was sent to Clusius in Vienna in 1576 from Constantinople, where it is possible the Horse-chestnut was already in cultivation, by the Baron David von Ungnad, ambassador of the Emperor Rudolph II. to the Ottoman Porte. Matthiolus gave the name of *Castaneæ equinæ* to the seeds, which he says were so called in Constantinople because they were given to horses as a remedy for broken wind. He described the leaves and fruit in a letter to Aldrovandus (*Epist.* Lib. iii. 125, ed. 1674). Clusius described the tree as *Castanea equina* in 1583 (*Rar. Stirp. Pannon.* 3, 5), from a specimen which was growing in Vienna in 1581. Gerard speaks of the Horse-chestnut in his *Herbal* as a rare tree in England in 1579. It was first planted in France in 1615 by a Monsieur Bachelier, whose garden in Paris was famous at that time (Loudon, *Arb. Brit.* i. 464). The Horse-chestnut was brought to the United States in the last century. John Bartram, writing to Peter Collinson in April, 1746, acknowledges the receipt of the seeds, of which he had hopes, as "some seemed to be pretty sound." (Darlington, *Memorials of Bartram and Marshall*, 175.)

[9] Loudon, *Arb. Brit.* i. 463. — Koch, *Hort. Dendr.* 59.

[10] Loiseleur; De Candolle, *Pl. Rar. Genev.* t. 24; *Herb. Amat.* t. 364. — De Candolle, *Prodr.* i. 597. — Loudon, *Arb. Brit.* i. 467. — *Fl. des Serres*, xxi. 129, t. 2229. — *Rev. Hort.* 1878, 370, t.

The history of this plant has never been satisfactorily determined. Even the date of its appearance is unknown, although it seems to have existed in France as early as 1812, and in England as early as 1820. The belief that it is a garden hybrid between *Æsculus Hippocastanum* and *Æsculus Pavia* of the southern United States is supported by the fact that it resembles the former in its dark green leaves with remote veins and in its echinate fruit, while the flowers have the four red petals of the latter. In stature it is intermediate between the two.

According to Koch (*Verhandl. Ver. Beförd. Gart. in den König. Preuss. Staat.* 1855), some of the seedlings of this plant do not differ from the true Horse-chestnut, while others produce smooth fruit.

Koch (*Hort. Dendr.* 59) refers to *Æsculus rubicunda* as synonyms the following: —

Æsculus carnea, Guimpel, Otto & Hayne, *Abbild. Holz.* 25, t. 22. — Hayne, *Dendr. Fl.* 43. — Lindley, *Bot. Reg.* t. 1056. — Watson, *Dendr. Brit.* ii. t. 121. — Don, *Gen. Syst.* i. 652. — Torrey & Gray, *Fl. N. Am.* i. 253.

Pavia carnea, Spach, *Ann. Sci. Nat.* ser. 2, ii. 53; *Hist. Veg.* iii. 22. — Sweet, *Brit. Fl. Gard.* ser. 2, t. 301.

Æsculus Watsoniana (Dietrich, *Syn.* ii. 1225. — *Pavia Watsoniana*, Spach, *Ann. Sci. Nat.* ser. 2, ii. 53) is probably another hybrid of the same parentage, or a variety of *Æ. rubicunda*, from which it differs principally in having darker colored flowers with shorter stamens.

[11] Among insects known as peculiar or specially partial to these trees, a leaf-miner (*Lithocolletis guttifinitella*, var. *æsculisella*, Chambers, *Canadian Entomologist*, iii. 111) is recorded as abundant in Kentucky, mining the upper surface of the leaves of *Æsculus glabra*. The larva of a small moth (*Proteoteras æsculana*) bores into the tender terminal branchlets of this tree in Missouri (Riley, *Trans. St. Louis Acad.* iv. 321); and its leaf-stalks, buds, and flowers are sometimes destroyed by the larvæ of *Steganoptycha claypoleana*, Riley (*Papilio*, iii. 191; *Am. Nat.* xv. 1009; xvi. 913).

The number of insects which are known to attack the Horse-chestnut in Europe is not large. It is worthy of note that two of the most troublesome have recently been introduced into America and threaten to become dangerous pests here. These are the wood-

attacked by many species. When they are planted in the streets of cities or in other unfavorable situations and weakened by drought and insufficient nourishment, fungal diseases[1] seriously affect them, often stripping them of their leaves by midsummer.

The generic name Æsculus[2] was derived from the classical name of an Oak, or other mast-bearing tree. It was first used by Linnæus, who discarded the earlier and better name of Tournefort,[3] Hippocastanum or Horse-chestnut, which indicates the resemblance of the large seeds to those of the Chestnut-tree, and their use by the Turks.

boring *Zeuzera pyrina*, F. (*Garden and Forest*, iii. 30), and the destructive Gypsy moth (*Ocneria dispar*, L., see Special *Bulletin Mass. Agric. Col.* Nov. 1889).

[1] A serious disease now common and widely spread through the northern United States is due to *Phyllosticta sphæropsoidea*, E. & E. (*Bull. Torrey Bot. Club*, x. 97). It makes its appearance in early summer, attacking the leaves of *Æsculus Hippocastanum*, *Æ. glabra*, and other species cultivated as ornamental and shade trees, and becomes more marked as the season advances. It appears at first in early summer in the form of yellow discolorations with a rather reddish margin. Later the patches become quite brown, giving the leaves the appearance of having been scorched by fire, sometimes extending from the midrib to the margin of the leaflets, and not infrequently covering the portions between the lateral veins without passing across them. The fruit dots are black and scattered. A mildew, *Uncinula flexuosa*, is developed on the different species of Æsculus, and in the western states a rust fungus, *Æcidium æsculi*, E. & K. (*Bull. Torrey Bot. Club*, xi. 114), disfigures the leaves of *Æsculus glabra*.

[2] The name was written *Esculus* by Linnæus in the *Hortus Cliffortianus* and in the first edition of the *Genera Plantarum*, but was afterwards changed by him to *Æsculus*, to conform with the classical spelling of the word. *Esculus* seems to have been first used in modern times by Caspar Bauhin (*Pinax*, 420) in connection with the Oak-tree, afterwards called *Quercus Esculus* by Linnæus.

[3] *Inst.* 611, t. 382.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Winter-buds without resinous coating.

- Petals nearly equal, shorter than the stamens; fruit tuberculate . . . . . 1. Æ. GLABRA.
- Petals unequal, longer than the stamens; fruit glabrous . . . . . 2. Æ. OCTANDRA.

Winter-buds resinous.

- Petals nearly equal, much shorter than the stamens; fruit smooth . . . . . 3. Æ. CALIFORNICA.

ÆSCULUS GLABRA.

Ohio Buckeye. Fetid Buckeye.

PETALS 4, shorter than the stamens. Fruit when young covered with prickles. Leaves usually 5-foliolate.

Æsculus glabra, Willdenow, *Enum.* 405. — Pursh, *Fl. Am. Sept.* i. 255. — Nuttall, *Gen.* i. 242. — De Candolle, *Prodr.* i. 597. — Guimpel, Otto & Hayne, *Abbild. Holz.* 28, t. 24. — Hayne, *Dendr. Fl.* 44. — Sprengel, *Syst.* ii. 166. — Don, *Gen. Syst.* i. 652. — Torrey & Gray, *Fl. N. Am.* i. 251. — Dietrich, *Syn.* ii. 1225. — Walpers, *Rep.* i. 424. — Rafinesque, *Alsograph. Am.* 69. — Gray, *Gen. Ill.* ii. 207, t. 176, 177. — Loudon, *Arb. Brit.* i. 467. — Chapman, *Fl.* 79. — Koch, *Dendr.* i. 508. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 42. — Watson & Coulter, *Gray's Man.* ed. 6, 116.

Æ. pallida, Willdenow, *Enum.* 406. — Nuttall, *Gen.* i. 242. — De Candolle, *Prodr.* i. 597. — Guimpel, Otto & Hayne, *Abbild. Holz.* 29, t. 25. — Sprengel, *Syst.* ii. 166. — Don, *Gen. Syst.* i. 652. — Lindley, *Bot. Reg.* xxiv. t. 51. — Rafinesque, *Alsograph. Am.* 69. — Loudon, *Arb. Brit.* i. 468.

Æ. echinata, Muehlenberg, *Cat.* 38.

Pavia Ohioensis, Michaux f. *Hist. Arb. Am.* iii. 242; *N. Am. Sylva*, ii. 217, t. 92. — Poiret, *Lam. Dict.* Suppl. iii. 593.

Æ. Ohioensis, De Candolle, *Prodr.* i. 597. — Don, *Gen. Syst.* i. 652. — Loudon, *Arb. Brit.* i. 467. — Nuttall, *Sylva*, ii. 71.

Pavia pallida, Spach, *Ann. Sci. Nat.* ser. 2, ii. 54; *Hist. Veg.* iii. 23.

Pavia glabra, Spach, *Ann. Sci. Nat.* ser. 2, ii. 54; *Hist. Veg.* iii. 24.

Æ. muricata, Æ. ochroleuca, Æ. verrucosa, Æ. alba, Rafinesque, *Alsograph. Am.* 68, 69.

? Æ. arguta, Buckley, *Proc. Phil. Acad.* 1860, 443.

A tree, rising occasionally to the height of seventy feet, usually much smaller, and rarely more than thirty feet tall, with a trunk which sometimes, although not often, attains a diameter of two feet, and slender spreading branches. The bark of the trunk is three quarters of an inch to an inch thick, ashy gray, densely furrowed, and broken into thick plates, the surface separating into many small roughened scales; that of the branches and young twigs is dark brown and scaly. The branchlets when they first appear are orange-brown and clothed with short fine pubescence; before the end of the season they are glabrous and covered with red-brown bark marked with scattered orange-colored lenticular spots. The winter-buds are two thirds of an inch long and acuminate, with thin, nearly triangular scales prominently keeled on the back, minutely apiculate, and slightly ciliate along the margins. The scales are pale brown, and those of the outer ranks are covered, like the winter branches, with a slight glaucous bloom. The others are bright red on the outer surface towards the bottom, the inner pair strap-shaped, and becoming an inch and a half or two inches long when fully developed; they are then bright yellow and remain on the base of the shoot until the leaves have grown to a third of their size. The leaves are composed of five to seven leaflets, and are borne on slender petioles four to six inches in length, with enlarged ends often covered above with clusters of dark brown chaff-like scales surrounding the bases of the petiolules; the leaflets are oval, oblong, or obovate, acuminate at the apex, and gradually contracted at the other end. They are finely and unequally serrate, and are at first sessile, but become slightly petiolate at maturity. Like the petioles, they are covered when they first appear, especially on the lower surface, with short soft pubescence; this soon disappears, and at maturity they are glabrous with the exception of a few hairs along the under side of the midribs and in the axils of the principal veins. They are yellow-green and paler on the lower than on the upper surface, with conspicuous yellow midribs and primary veins. The inflorescence, which appears from April to May, is five or six inches in length, two or three inches in breadth, and more or less densely covered with pubescence, the short branches being usually four to six-flowered. The pale yellow-green flowers are mostly unilateral,

and from half an inch to an inch long, or more than twice the length of the pedicels. The petals are nearly equal in length and puberulous; the thin limb is about twice the length of the claw; in the lateral pair it is broadly ovate or oblong, and in the superior pair oblong-spatulate, much narrower, and sometimes marked with red stripes. There are usually seven stamens with long exserted curved pubescent filaments and orange-colored anthers bearing a few scattered hairs. The ovary is pubescent and covered with long slender deciduous prickles with thickened tubercle-like bases, which enlarge and roughen the surface of the fruit which is ovate or irregularly obovate, pale brown, and an inch to almost two inches long, with thin or sometimes thick valves, and is borne on stout stems half an inch to nearly an inch in length. The seed is an inch or an inch and a half broad.

Æsculus glabra is confined to the valley of the Mississippi River. It is found on the western slopes of the Alleghany Mountains from Pennsylvania to northern Alabama, extending west to southern Iowa, central Kansas, and the Indian Territory. The younger Michaux found the Fetid Buckeye growing in large numbers on the banks of the Ohio River between Pittsburgh and Marietta; but it is now nowhere abundant, and, although distributed over a wide extent of territory, is the least common of the American arborescent Horse-chestnuts. It is always found in rich moist soil in river-bottom lands or on the banks of streams. It is most common and reaches its greatest size in the valley of the Tennessee River in Tennessee and northern Alabama.

The wood of *Æsculus glabra* is light, soft, close-grained, but not strong, and is often blemished by dark lines of decay. It is nearly white with darker colored thin sapwood, composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.4542, a cubic foot weighing 28.31 pounds. It is not distinguished commercially from the wood of *Æsculus octandra*, and, like this, is used in the manufacture of artificial limbs, for which the wood of Æsculus is preferred to that of all other American trees, wooden ware, wooden hats, and paper pulp. It is also occasionally sawed into lumber.

An extract of the bark of *Æsculus glabra* has been found to act as an irritant of the cerebro-spinal system.[1]

Æsculus glabra was not noticed by the early botanists who explored the valley of the Mississippi River, and Muehlenberg[2] probably first distinguished its specific characters and sent it to the German botanist Willdenow, who first described it.

Æsculus glabra was not introduced into English gardens until 1821.[3] It is the least desirable of the American species as a garden plant, and is rarely cultivated. It is perfectly hardy in New England, where it forms a small round-headed tree flowering at the end of May and ripening its fruit in October.

[1] Hale, *New Remedies*, 1877, 19. — Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 44, t. 44.

[2] Gotthilf Heinrich Muehlenberg (1753–1815); a member of a distinguished Lutheran family of German origin, was born in New Providence, Montgomery County, Pennsylvania, and received his early education in the common schools of Philadelphia, and afterwards at Halle, where he was sent to study literature, the sciences, and theology. He returned to America in 1770, and was appointed assistant pastor of the Lutheran Church in Philadelphia, and ten years later pastor at Lancaster, Pennsylvania, a position which he filled assiduously and faithfully during the remainder of his life. Muehlenberg was noted for his knowledge of botany, especially of the Grasses, and enjoyed the friendship and correspondence of the principal American and European botanists of his time. His most important works are the *Index Floræ Lancastriensis*, published in 1793 in the third volume of the *Transactions of the American Philosophical Society*; *Catalogus Plantarum Americæ Septentrionalis*; and *Descriptio uberior Graminum*. *Muehlenbergia*, a genus of Grasses widely scattered in its many species over the surface of the earth, fitly associates his name with the family of plants that he studied so successfully.

[3] Nicholson, *Dictionary of Gardening*.

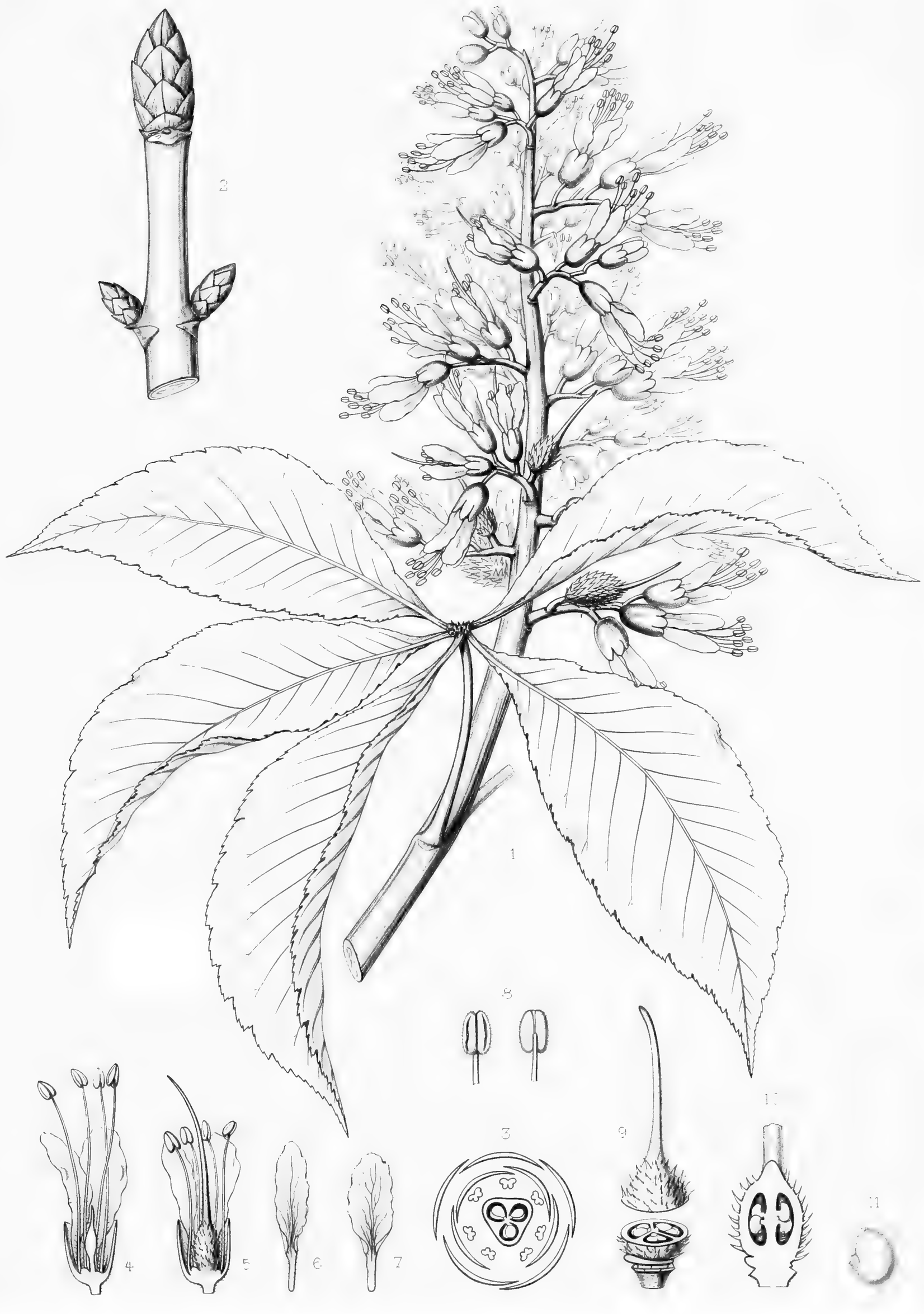
EXPLANATION OF THE PLATES.

PLATE LXVII. *ÆSCULUS GLABRA.*

1. A flowering branch, natural size.
2. A winter-bud.
3. Diagram of a flower.
4. Vertical section of a staminate flower, enlarged.
5. Vertical section of a pistillate flower, enlarged.
6. A lateral petal, enlarged.
7. A superior petal, enlarged.
8. A stamen, front and rear view.
9. A pistil, cut transversely, enlarged.
10. Vertical section of an ovary, enlarged.
11. An ovule, much magnified.

PLATE LXVIII. *ÆSCULUS GLABRA.*

1. A fruiting branch, natural size.
2. A half-grown fruit, natural size.
3. A fruit with a portion of two of the valves removed, natural size.
4. A seed, natural size.
5. Vertical section of a seed, natural size.
6. An embryo, natural size.



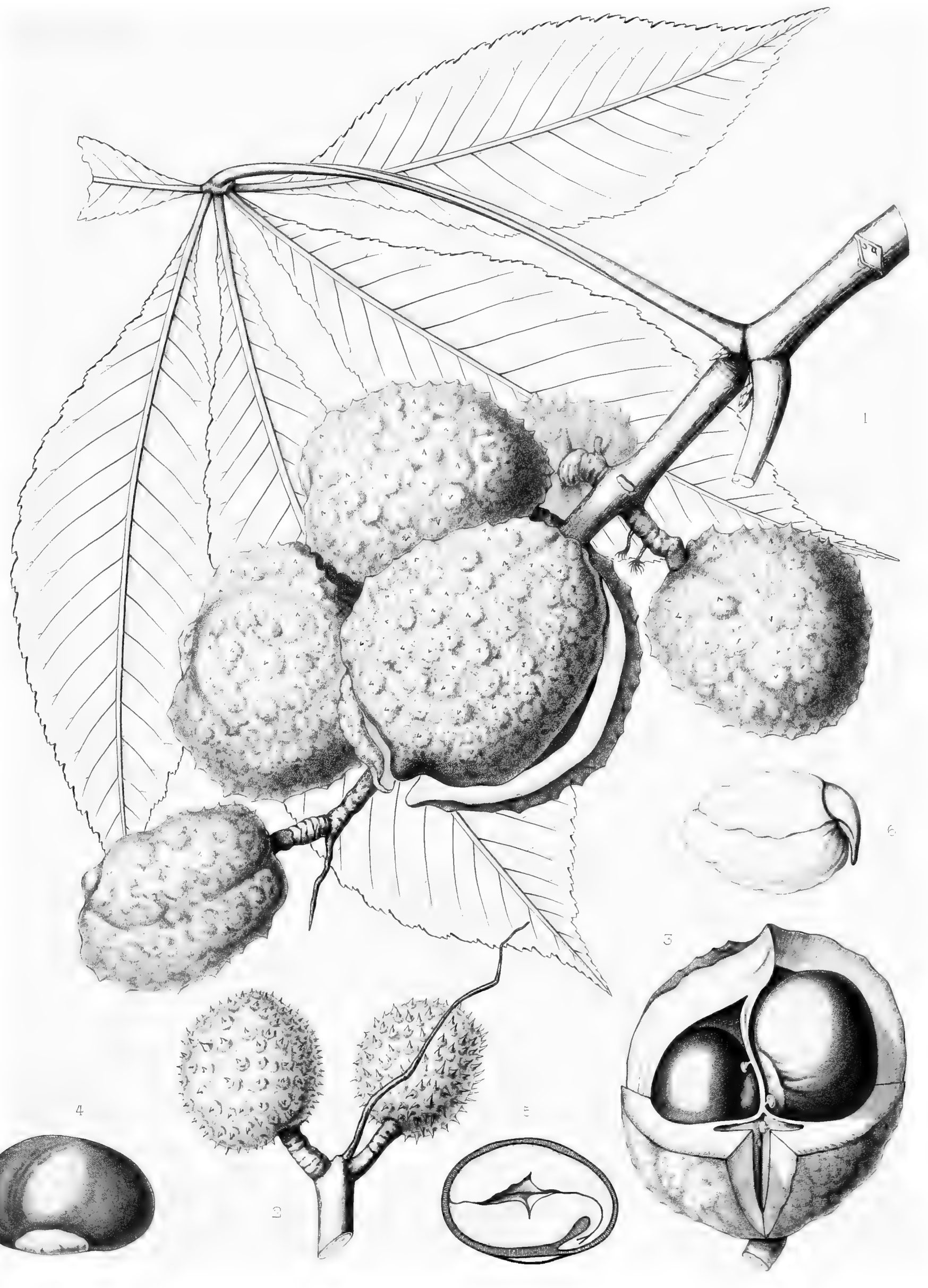
C.E. Faxon del

Picart fr sc

ÆSCULUS GLABRA, Willd.

A Riocreux direx.t

Imp R. Taneur Paris



C E. Faxon del.

Picart fr. sc.

ÆSCULUS GLABRA, Willd.

A. Riocreux direx.t

Imp.R. Taneur, Paris.

ÆSCULUS OCTANDRA.

Sweet Buckeye.

PETALS 4, longer than the stamens, the 2 upper narrower and longer than the others. Fruit smooth. Leaves 5 to 7-foliolate.

Æsculus octandra, Marshall, *Arbust. Am.* 4. — Sargent, *Garden and Forest*, ii. 364.

Æ. lutea, Wangenheim, *Schrift. Gesell. Nat. Fr. Berlin*, viii. 133, t. 6. — Michaux, *Fl. Bor.-Am.* i. 219. — Persoon, *Syn.* i. 403. — Koch, *Dendr.* i. 509.

Æ. flava, Aiton, *Hort. Kew.* i. 494. — Schmidt, *Oestr. Baum.* i. 41, t. 40. — B. S. Barton, *Coll.* i. 13; *Elem. Bot.* t. 15, f. 2. — Willdenow, *Spec.* ii. 286; *Enum.* 405; *Berl. Baumz.* 16. — Desfontaines, *Hist. Arb.* i. 385. — Pursh, *Fl. Am. Sept.* i. 255. — Nuttall, *Gen.* i. 242. — Guimpel, Otto & Hayne, *Abbild. Holz.* 27, t. 23. — Hayne, *Dendr. Fl.* 44. — Elliott, *Sk.* i. 436. — Watson, *Dendr. Brit.* ii. 163, t. 163. — Loddiges, *Bot. Cab.* t. 1280. — Torrey & Gray, *Fl. N. Am.* i. 252. — Dietrich, *Syn.* ii. 1225. — Walpers, *Rep.* i. 424. — Schnizlein, *Icon.* t. 230**, f. 3. — Koch, *Verhandl. Ver. Beförd. Gart. in den König. Preuss. Staat.* 1855. — Chapman, *Fl.* 80. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 48. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 43. — Watson & Coulter, *Gray's Man.* ed. 6, 163.

Pavia flava, Moench, *Meth.* 66. — De Candolle, *Prodr.* i. 598. — Don, *Gen. Syst.* i. 653. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 55; *Hist. Veg.* iii. 25. — Loudon, *Arb. Brit.* i. 471, t. — Rafinesque, *Alsograph. Am.* 73.

Pavia lutea, Poiret, *Lam. Dict.* v. 94. — *Nouveau Duhamel*, iii. 155, t. 38. — Michaux f. *Hist. Arb. Am.* iii. 237, t. 11.

Paviana flava, Rafinesque, *Fl. Ludovic.* 87.

Æ. neglecta, Lindley, *Bot. Reg.* xii. t. 1009.

Pavia neglecta, Don; Loudon, *Hort. Brit.* i. 143; *Gen. Syst.* i. 653. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 55; *Hist. Veg.* iii. 24. — Loudon, *Arb. Brit.* i. 472.

Pavia fulva, P. bicolor, Rafinesque, *Alsograph. Am.* 74.

A tree, rising sometimes to the height of ninety feet, with a tall straight trunk two and a half or three feet in diameter and small rather pendulous branches; or towards the southern and southwestern limits of its range reduced to a low shrub. The bark of the trunk is three quarters of an inch thick, dark brown, and divided by shallow fissures, the surface separating into small thin scales. The winter-buds are two thirds of an inch to an inch in length and rather obtuse, with broadly ovate pale brown scales, rounded on the back, minutely apiculate, ciliate on the margins, destitute of resin, and covered with a slight glaucous bloom. The inner scales sometimes grow to a length of two inches, and are bright yellow or occasionally scarlet. The branchlets are glabrous or nearly so and orange-brown when they first appear, and in their second year are pale brown and marked by numerous irregularly developed lenticular spots. The leaves, which are composed of five to seven leaflets, are borne on slender glabrous or slightly pubescent petioles four to six inches in length; the leaflets are elliptical or obovate-oblong, acuminate at the apex and gradually contracted at the base, and are sharply and equally serrate, four to six inches long and one and a half to two and a half inches broad; they are short-petiolulate, glabrous above with the exception of the midribs and veins, which are sometimes clothed with a reddish brown pubescence, and more or less canescent-pubescent on the lower surface, which becomes glabrous at maturity with the exception of a few hairs along the midribs and in the axils of the principal veins. They are dark yellow-green and paler on the lower than on the upper surface. The flowers open when the leaves are about half grown, or from March, in the extreme southwest, to the middle of June at high elevations on the Alleghany Mountains. They are an inch to an inch and a half long, pale or dark yellow, with short pedicels, and are mostly unilateral on the branches of the pubescent inflorescence which is from five to seven inches in length. The petals are connivent, very unequal, puberulent, the claws villous within; the spatulate limb of the superior pair is minute, the long claw exceeding the lobes of the calyx, while that of the lateral pair is large, obovate or nearly round, and subcordate at the base. The stamens, with straight or inclining subulate villous filaments, are usually seven in number and rather shorter than the petals. The ovary is pubescent. The fruit is two to three

inches long, with thin smooth or slightly pitted pale brown valves, and is generally two-seeded. The seeds are one and a half to nearly two inches broad.

Æsculus octandra occurs in Allegheny County, Pennsylvania, and extends along the Alleghany Mountains to the neighborhood of Augusta, Georgia, and to northern Alabama, and westward and southwestward to southern Iowa, the Indian Territory, and to western Texas, where it has been noticed as a low shrub near Boerne in the valley of the upper Cibolo River. It grows in rich soil in river-bottom lands or on the moist slopes of the higher Alleghany Mountains. On these slopes in Tennessee and North Carolina it is most common and reaches its greatest size, sending up tall straight shafts which are sometimes free of branches for sixty or seventy feet from the ground.

The wood of *Æsculus octandra* is light, soft, close-grained, and difficult to split, with numerous but very obscure medullary rays. It is creamy white, the thick sapwood being hardly distinguishable. The specific gravity of the absolutely dry wood is 0.4274, a cubic foot weighing 26.64 pounds. It is used for the same purposes as the wood of *Æsculus glabra*.

A variety[1] of this tree, characterized by its purple or red flowers, by the dense pale pubescence which clothes the under surface of its leaves, petioles, and inflorescence, and by its lighter colored bark, is not rare on the Alleghany Mountains from West Virginia southward, and in Texas.

Æsculus octandra was first described by Humphrey Marshall in 1785, although, according to Aiton, it was cultivated in England as early as 1764 by a Mr. John Greening. It is the handsomest of the North American Horse-chestnuts, and one of the most beautiful of the trees which compose the deciduous forests that cover the southern Alleghany Mountains.

Æsculus octandra, especially the variety with purple flowers, has long been a favorite in gardens where, if planted in good soil, it makes a handsome tree with a rather narrow head of pendulous branches. It is very hardy and less often disfigured by fungal diseases than the Old World Horse-chestnut; but its flowers are not so showy, and it seldom attains so great a size.

[1] *Æsculus octandra*, var. *hybrida*.

Æ. hybrida, De Candolle, *Cat. Hort. Monsp.* 75. — Poiret, *Lam. Dict.* Suppl. iv. 334.

Æ. discolor, Pursh, *Fl. Am. Sept.* i. 255. — Nuttall, *Gen.* i. 242. — *Bot. Reg.* iv. t. 310. — Elliott, *Sk.* i. 436. — Sprengel, *Syst.* ii. 167. — *Sert. Bot.* iv. t. — Walpers, *Ann.* iv. 381.

Pavia discolor, Poiret, *Lam. Dict.* Suppl. v. 769. — Don, *Gen. Syst.* i. 653. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 58; *Hist. Veg.* iii. 28. — Loudon, *Arb. Brit.* i. 472.

Pavia hybrida, De Candolle, *Prodr.* i. 598. — Don, *Gen. Syst.* i. 653. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 56; *Hist. Veg.* iii. 27. — Loudon, *Arb. Brit.* i. 472. — Koch, *Dendr.* i. 512.

Æ. Pavia, var. *discolor*, Torrey & Gray, *Fl. N. Am.* i. 252. — Walpers, *Rep.* i. 424.

Æ. flava, var. *purpurascens*, Gray, *Man.* ed. 5, 118. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 43. — Watson & Coulter, *Gray's Man.* ed. 6, 116.

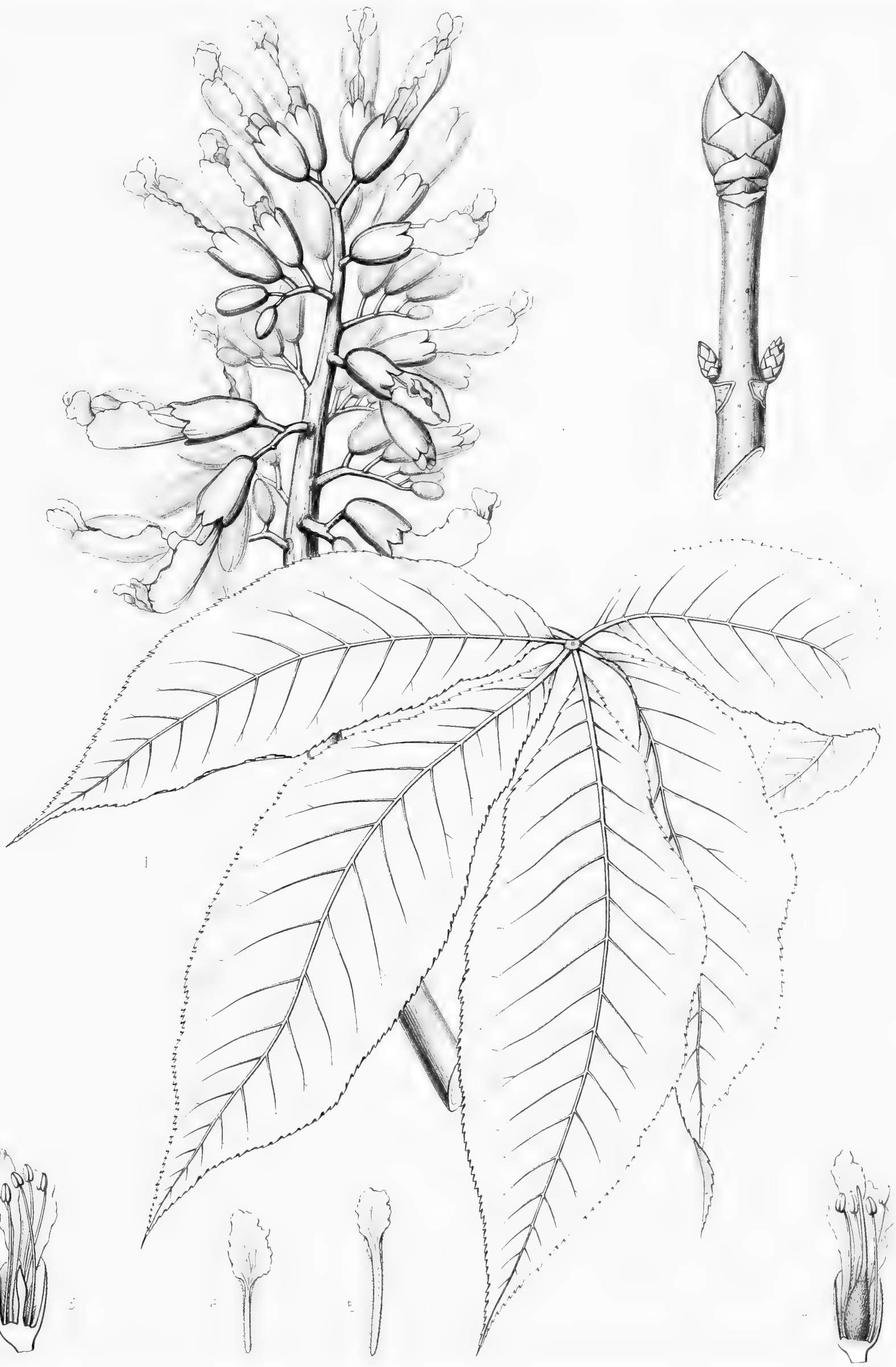
EXPLANATION OF THE PLATES.

PLATE LXIX. ÆSCULUS OCTANDRA.

1. A flowering branch, natural size.
2. A winter-bud, natural size.
3. Vertical section of a staminate flower, natural size.
4. Vertical section of a pistillate flower, natural size.
5. A lateral petal, natural size.
6. An upper petal, natural size.

PLATE LXX. ÆSCULUS OCTANDRA.

1. A fruiting branch, natural size.
2. A seed, natural size.
3. Vertical section of a seed, natural size.
4. An embryo, natural size.



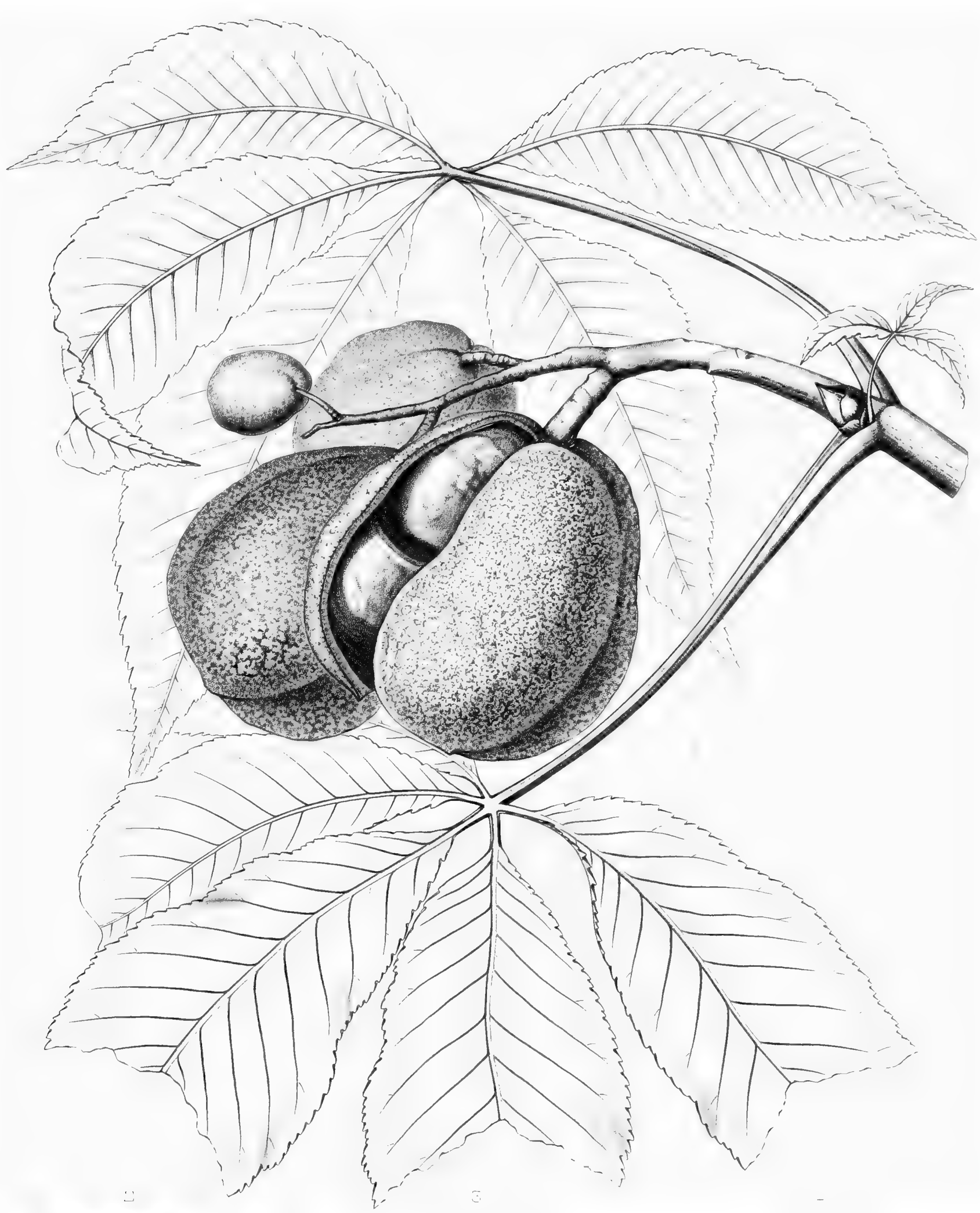
C. E. Faxon del

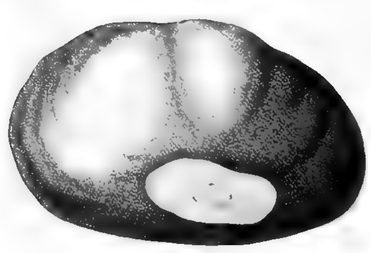
Picart fr. sc.

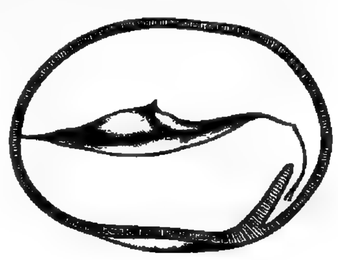
ÆSCULUS OCTANDRA, Marsh

A. Riocreux direx.t

Imp. R. Taneur Paris.







C. E. Faxon del.

Picart fr. sc.

ÆSCULUS OCTANDRA, Marsh.

A. Riocreux direx.r

Imp.R. Taneur Paris

ÆSCULUS CALIFORNICA.

Buckeye.

PETALS 4, nearly equal, much shorter than the stamens. Fruit smooth. Leaves 4 to 7-foliolate.

Æsculus Californica, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 251; *Sylva*, ii. 69, t. 64. — Hooker & Arnott, *Bot. Voy. Beechey*, 327. — Dietrich, *Syn.* ii. 1225. — Walpers, *Rep.* i. 424; *Ann.* vii. 624. — Bentham, *Bot. Voy. Sulphur*, 9; *Pl. Hartweg.* 301. — *Rev. Hort.* 1855, 150, f. 10, 11. — Torrey, *Pacific R. R. Rep.* iv. 74; *Bot. Mex. Bound. Surv.* 48; *Bot. Wilkes Explor. Exped.* 260. — Newberry, *Pacific R. R. Rep.* vi. 20, 69, f. 1. — Bolander, *Proc. Cal. Acad.* iii. 78. — Koch, *Dendr.* i. 513. — Brewer & Watson, *Bot. Cal.* i. 106. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 43.

Calothyrsus Californica, Spach, *Ann. Sci. Nat.* ser. 2, ii. 62; *Hist. Veg.* iii. 35.

Pavia Californica, Hartweg, *Jour. Hort. Soc. London*, ii. 123.

A widely branched tree, rarely thirty or forty feet in height, with a short stout trunk two or three feet in diameter, and often expanded at the base to twice that size; or more often a shrub with spreading branches ten or fifteen feet high, forming broad dense thickets. The bark of the trunk is a quarter of an inch thick, smooth, and light gray or nearly white. The winter-buds are acuminate and covered with narrow dark brown scales rounded on the back and thickly coated with resin. The branches are glabrous and pale reddish brown when they first appear, becoming darker in their second season. The leaves are composed of from four to seven, but usually of five leaflets, and are borne on slender grooved petioles three or four inches long; the leaflets are oblong-lanceolate, acute, narrowed, and obtuse or somewhat rounded at the base, sharply serrate, four to six inches in length and one and a half to two inches in breadth, with slender petiolules half an inch to an inch long; they are dark green above, paler below, slightly pubescent when they first unfold, and glabrous or nearly so at maturity; they fall early, often by midsummer, leaving the branches naked for a large part of the year. The inflorescence, which appears from May to July when the leaves are fully grown, is long-stemmed, three to six inches in length, and covered with thick fine pubescence. The flowers are an inch or more long with short pedicels; they are mostly unilateral on the long branches of the thyrsus, and are white or pale rose-colored. The calyx is two-lobed, slightly toothed, and much shorter than the narrow oblong petals. The stamens, which vary in number from five to seven, have long erect exserted slender filaments and bright orange-colored anthers. The ovary is densely pubescent. The fruit is obovate, pear-shaped, and often somewhat gibbous on the outer side, with very thin smooth pale brown valves; it is usually one-seeded, two or three inches long, and is borne on rather slender stems a quarter to half an inch in length. The seed is an inch and a half to two inches broad.

Æsculus Californica is distributed from the valley of the upper Sacramento River in Mendocino County, California, along the coast ranges to San Luis Obispo County, and on the western foothills of the Sierra Nevada Mountains to the northern slopes of the Tejon Pass in Kern County, with an extreme station in Antelope valley of the San Gabriel Mountains in Los Angeles County.[1] It is found on the borders of streams, which it enlivens in spring and early summer with its abundant and showy flowers, and reaches its greatest size in the cañons of the coast ranges north of San Francisco Bay.

The wood of *Æsculus Californica* is soft, light, and very close-grained, with numerous obscure medullary rays. It is white or faintly tinged with yellow, the thin sapwood, composed of ten or twelve layers of annual growth, being hardly distinguishable. The specific gravity of the absolutely dry wood is 0.4980, a cubic foot weighing 31.04 pounds.

[1] S. B. Parish.

Æsculus Californica was first noticed by Dr. P. E. Botta, and was first described by Spach, who established a genus to receive it, differing from Æsculus only in its tubular bilobed calyx and erect stamens. It was introduced into English gardens by the Messrs. Veitch, in whose nursery at Exeter it flowered in 1858.[1] It was first planted in Paris in 1854 in the Jardin des Plantes, where it flowered in 1862.[2] It is now rarely cultivated, although it is one of the most ornamental trees of the whole genus.

[1] *Bot. Mag.* t. 5077. — *Fl. des Serres,* xiii. 39, t. 1312. — *Gard. Chron.* 1858, 844. — *Belg. Hort.* ix. 121.

[2] *Rev. Hort.* 1862, 369, f.

EXPLANATION OF THE PLATES.

Plate LXXI. Æsculus Californica.

1. A flowering branch, natural size.
2. Diagram of a flower, natural size.
3. Vertical section of a staminate flower, natural size.
4. Vertical section of a pistillate flower, natural size.
5. A stamen, enlarged.
6. Vertical section of an ovary, enlarged.
7. A winter-bud, natural size.

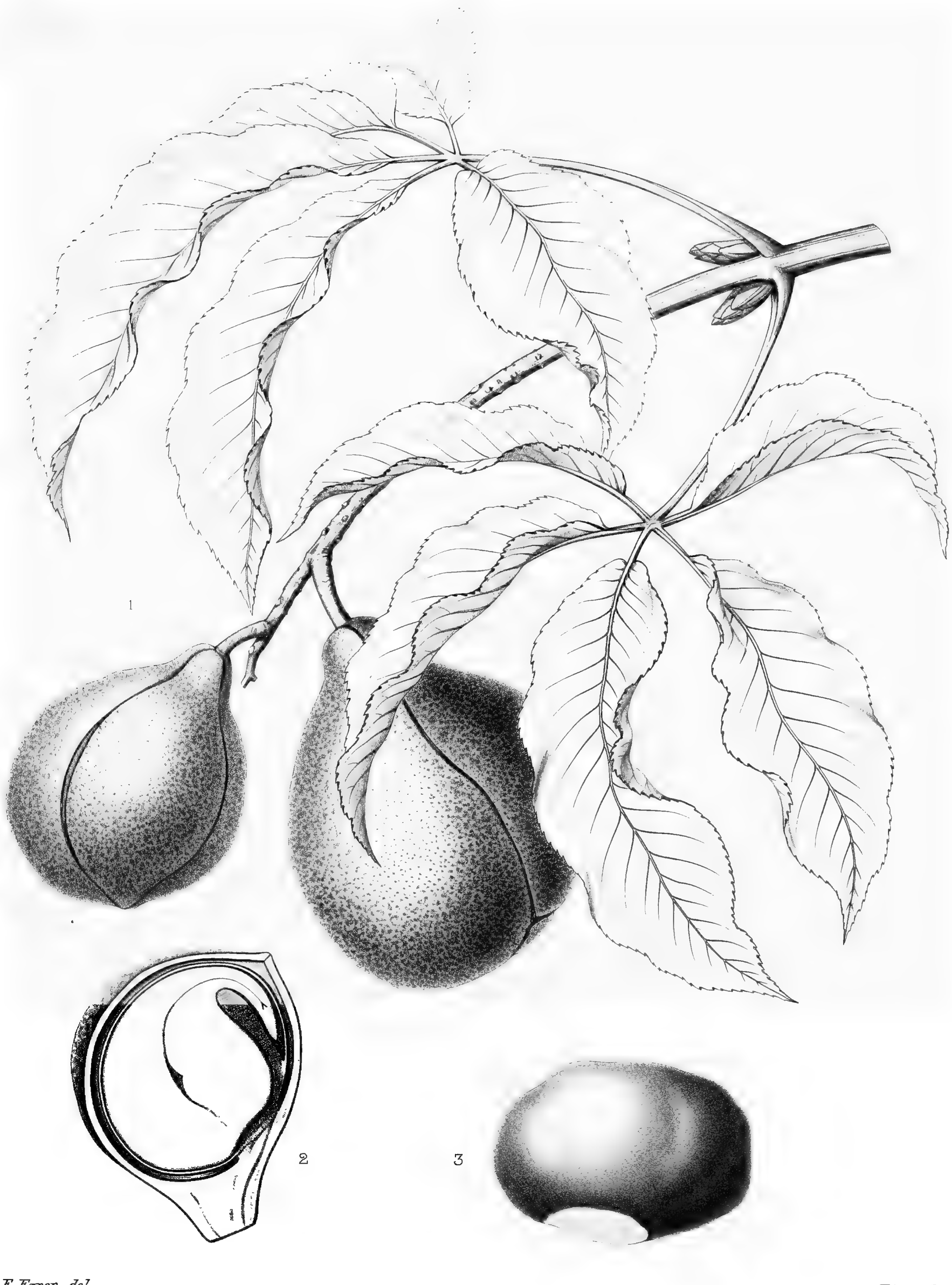
Plate LXXII. Æsculus Californica.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, natural size.
3. A seed, natural size.

C. E Faxon del. Picart fr. sc.

ÆSCULUS CALIFORNICA, Nutt.

A. Riocreux direx.t Imp.R. Taneur.Paris.



C.E. Faxon del.

Picart fr sc.

ÆSCULUS CALIFORNICA, Nutt.

A. Riocreux direx.r

Imp. R. Taneur. Paris.

UNGNADIA.

FLOWERS polygamous, irregular; calyx 5-lobed, the lobes imbricated in æstivation; petals 4 or 5, imbricated in æstivation, hypogynous, conspicuously crested; ovary stipitate, 3-celled; ovules 2, homotropous. Fruit a coriaceous capsule, 3-celled and loculicidally 3-valved. Leaves alternate, unequally pinnate, destitute of stipules.

Ungnadia, Endlicher, *Atakt. Bot.* t. 36; *Nov. Stirp. Dec.* 75; *Gen.* 1075. — Meisner, *Gen.* 346. — Torrey & Gray, *Fl. N. Am.* i. 253, 684. — Gray, *Gen. Ill.* ii. 209. — Bentham & Hooker, *Gen.* i. 398. — Baillon, *Hist. Pl.* v. 423.

A small tree or shrub, with thin pale gray fissured bark, slender terete slightly zigzag branchlets marked with large conspicuous leaf-scars, small obtuse nearly globose winter-buds covered with chestnut-brown scales, and thick fleshy roots. Leaves alternate, long-petioled, four or five, or rarely three-foliolate, deciduous; leaflets ovate-lanceolate, acuminate, rounded, or wedge-shaped, often oblique at the base, irregularly crenulate-serrate, coated at first on the lower surface, like the petioles, with dense pale tomentum, pilose above, glabrous at maturity with the exception of a few hairs on the lower surface along the principal veins, pinnately veined, reticulated, the terminal one long-petiolulate. Flowers large and showy in small pubescent fascicles or simple corymbs appearing just before or simultaneously with the new leaves from the axils of those of the previous year, usually from separate buds, or occasionally from the base of a leafy branch. Pedicels jointed in the middle. Calyx-lobes hypogynous, oblong-lanceolate, somewhat united irregularly at the base only, deciduous. Petals four by the suppression of the anterior one, or five and then alternate with the lobes of the calyx, hypogynous on the margin of a thickened truncate torus, unguiculate, bright rose-colored, deciduous; when four, almost equal, unequal when five; the claw as long as the lobes of the calyx, nearly erect, clothed with tomentum especially on the inner surface, and conspicuously appendaged at the summit with a fimbriated crest of short fleshy tufted threads, the blade obovate, spreading, often erose-crenulate. Disk unilateral, oblique, lingulate, surrounding and connate with the base of the stipe of the ovary. Stamens seven to ten, usually eight or nine, inserted on the oblique edge of the disk, much exserted and unequal in the sterile flower, the anterior one shorter than the others, equal or almost so and shorter than the petals in the pistillate flower; filaments filiform; anthers oblong, attached near the base, two-celled, the cells opening longitudinally. Ovary ovoid, three-celled, pilose, raised on a long stipe; rudimentary in the staminate flower; style subulate, filiform, elongated, slightly curved upwards; stigma minute, terminal; ovules two, borne on the inner angle of the cell near its middle, ascending, amphitropous or anatropous, the micropyle inferior. Fruit broadly ovate, a little three-lobed, conspicuously stipitate, crowned with the remnants of the style, unarmed, rugosely roughened and dark reddish brown, loculicidally three-valved, the valves somewhat cordate, bearing the dissepiment on the middle. Seed generally solitary by abortion, almost spherical, destitute of albumen; testa coriaceous, very smooth and shining, dark chestnut-brown or almost black; hilum broad, light-colored; tegmen thin. Embryo filling the coat of the seed; cotyledons thick and fleshy, nearly hemispherical, conferruminate, remaining below ground in germination, incumbent on the short conical descending radicle turned towards the hilum.

The wood of Ungnadia is heavy and close-grained, although rather soft and brittle. It is red tinged with brown with lighter colored sapwood, and contains numerous inconspicuous medullary rays and many evenly distributed open ducts. The specific gravity of the absolutely dry wood is 0.6332, a cubic foot weighing 39.46 pounds.

The seeds of Ungnadia have a sweet rather pleasant flavor, but possess powerful emetic properties and are reputed to be poisonous.

Ungnadia was discovered in western Texas by Thomas Drummond. It was named in honor of the Baron Ferdinand von Ungnad, ambassador of the Emperor Rudolph II. at the Ottoman Porte, who in 1576 sent seeds of the Horse-chestnut tree from Constantinople to Clusius at Vienna. It is represented by a single species.

UNGNADIA SPECIOSA.

Spanish Buckeye.

Ungnadia speciosa, Endlicher, *Atakt. Bot.* t. 36; *Nov. Stirp. Dec.* 75. — Torrey & Gray, *Pacific R. R. Rep.* ii. 162. — Walpers, *Rep.* i. 423; v. 371; *Ann.* vii. 625. — Gray, *Gen. Ill.* ii. 211, t. 178, 179; *Jour. Bost. Soc. Nat. Hist.* vi. 167 (*Pl. Lindheim.* ii.); *Pl. Wright.* i. 38; ii. 30 (*Smithsonian Contrib.* iii., iv.); *Mem. Am. Acad.* n. ser. v. 299. — Torrey, *Bot. Mex. Bound. Surv.* 48. — *Fl. des Serres,* x. 217, t. 1059. — Schnizlein, *Icon.* t. 230**, f. 2, 8. — *L'Hort. Franc.* 1865, t. 15. — Koch, *Dendr.* i. 515. — Watson, *Proc. Am. Acad.* xvii. 337. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 44. — Hemsley, *Bot. Biol. Am. Cent.* i. 212.

U. heterophylla, Scheele, *Linnæa,* xxi. 589.

U. heptaphylla, Scheele, *Linnæa,* xxii. 352; *Roemer Texas,* 432.

The Ungnadia sometimes grows, under favorable conditions, to the height of twenty-five or thirty feet, with a trunk six or eight inches in diameter, dividing, at some distance from the ground, into a number of slender upright branches, and covered with light gray bark rarely more than a quarter of an inch thick, the surface netted with shallow fissures; or more often a shrub sending up many stems from the ground. The branchlets are covered during their first season with short fine pubescence and are then light orange-brown; in their second year they are pale brown tinged with red, glabrous, and marked with scattered lenticels. The leaves appear from March to April simultaneously with or just after the flowers, and are five to seven inches long, with rather coriaceous leaflets which are dark green and lustrous on the upper, and pale or occasionally rufous on the lower surface, three to five inches in length and an inch and a half to two inches in breadth. The petiolule of the terminal leaflet is sometimes a quarter of an inch long, those of the lateral leaflets rarely exceeding an eighth of an inch. The flowers, which are arranged in short umbels one and a half or two inches long, are an inch across when expanded, and often quite hide the branches for a space of a foot or more. The fruit is two inches broad at maturity and opens in October, the empty pods often remaining on the branches until the appearance of the flowers the following year.

The Ungnadia is widely scattered from the valley of the Trinity River in Texas to the Organ Mountains of New Mexico, and to the Sierra Madre of Nuevo Leon and the mountains of Chihuahua. It occupies the borders of streams, the slopes of limestone hills, and the sides of mountain cañons, and is most common and reaches its largest size forty or fifty miles from the Texas coast west of the Colorado River. Farther east and west and in Mexico it is usually shrubby, growing from six to ten feet high.

When its branches are covered with its delicate and beautiful flowers the Spanish Buckeye is one of the most attractive and ornamental of the small trees or shrubs of North America. It was introduced into cultivation from seed sent in 1848 by Friedrich Lindheimer [1] to the Botanic Gardens at Vienna and at Cambridge, Massachusetts. It is still occasionally cultivated in southern Europe and in the southern Atlantic and Gulf states, where it is perfectly at home and annually produces flowers and fruit.[2]

[1] See i. 74.

[2] *Ungnadia speciosa* appears to have been first cultivated in the open ground in the United States by Mr. P. J. Berckmans at Augusta, Georgia. Later it has been successfully grown by Dr. Charles Mohr of Mobile.

EXPLANATION OF THE PLATE.

Plate LXXIII. Ungnadia speciosa.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a staminate flower, enlarged.
4. Vertical section of a pistillate flower, enlarged.
5. Cross section of an ovary, enlarged.
6. Vertical section of an ovary, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, natural size.
10. An embryo, natural size.
11. A winter branch, natural size.

C E Faxon del.

Picart fr. sc.

UNGNADIA SPECIOSA, Endl

A Riocreux direct.t

Imp.R Taneur Paris

SAPINDUS.

Flowers polygamo-diœcious, regular; sepals 4 or 5, imbricated in æstivation; petals 4 or 5, naked or appendiculate, imbricated in æstivation. Ovary 2 to 4-celled; ovules solitary. Fruit baccate, coriaceous, 1 to 3-seeded.

Sapindus, Linnæus, *Gen.* 359. — Adanson, *Fam. Pl.* ii. 343. — A. L. de Jussieu, *Gen.* 247. — Cambessedes, *Mém. Mus.* xviii. 26. — Endlicher, *Gen.* 1070. — Meisner, *Gen.* 53. — Gray, *Gen. Ill.* ii. 213. — Bentham & Hooker, *Gen.* i. 404. — Baillon, *Hist. Pl.* v. 394. — Radlkofer, *Sitz. Akad. Münch.* xx. 283.

Aphania, Blume, *Bijdr. Fl. Ned. Ind.* 236. — Endlicher, *Gen.* 1070. — Meisner, *Gen.* 52.

Didymococcus, Blume, *Rumphia*, iii. 103.

Trees or shrubs, sometimes subscandent, with terete branches, thick fleshy roots, and bitter and detersive properties. Leaves alternate, destitute of stipules, abruptly pinnate or rarely one-foliolate; leaflets alternate or opposite, entire or occasionally serrate. Flowers minute, in ample axillary or terminal racemes or panicles. Pedicels short, from the axils of minute deciduous bracts. Sepals unequal, slightly united at the base. Petals equal, alternate with the sepals, inserted under the thick edge of the disk, unguiculate, naked or often furnished at the summit of the claw, on the inside, with a two-cleft scale, deciduous. Disk annular, fleshy, entire or crenately-lobed, hypogynous or perigynous. Stamens usually eight or ten, rarely four to seven, inserted on the disk immediately under the ovary, equal; filaments subulate or filiform, often pilose, exserted in the sterile, much shorter in the fertile flower; anthers oblong, attached near the base, introrse, two-celled, the cells opening longitudinally. Ovary sessile, entire or two to four-lobed, two to four-celled, contracted into a short columnar style; rudimentary in the staminate flower; stigma two to four-lobed, the lobes spreading; ovules solitary in each cell, anatropous or amphitropous, ascending from below the middle of the inner angle of the cell; raphe ventral; micropyle inferior. Fruit usually formed of one globose fleshy or coriaceous carpel, the others abortive, their rudiments remaining at its base; or of two or sometimes of three carpels more or less connate by their bases, and then two or three-lobed. Seed solitary in each carpel, obovate or globose, destitute of albumen; testa crustaceous or membranaceous, smooth, black or dark brown; tegmen membranaceous or fleshy; hilum oblong, surrounded (at least in the North American species) by an ariloid tuft of long pale silky hairs. Embryo incurved or straight; cotyledons thick and fleshy, incumbent; radicle very short, inferior, near the hilum.

The genus Sapindus is widely distributed through the tropics, especially in Asia, occasionally extending into subtropical regions. About forty species have been distinguished.[1] One of these, the type of the genus and a common West Indian tree, reaches the shores of southern Florida, and another occurs in the southern part of the North American continent from the coast of Georgia to northern Mexico.[2] Sapindus existed in Europe in the Tertiary period, and even earlier, with forms which represent the ancestors of existing American species.[3]

[1] De Candolle, *Prodr.* i. 607. — Blume, *Rumphia*, iii. 93. — Walpers, *Rep.* i. 416; v. 362; *Ann.* i. 134; ii. 211; iv. 378. — Thwaites, *Enum. Pl. Zeylan.* 55. — Turczaninow, *Bull. Mosc.* i. 401. — Hooker f. *Fl. Brit. Ind.* i. 682. — Miquel, *Fl. Ind. Bat.* i., ii. 551; *Suppl.* 198, 508; *Mus. Lugd. Bat.* iii. 92. — Harvey & Sonder, *Fl. Cap.* i. 240. — Oliver, *Fl. Trop. Afr.* i. 430. — Bentham, *Fl. Austral.* i. 464. — St. Hilaire, *Pl. Usuelles Brasil.* 368; *Fl. Bras. Merid.* i. 300, t. 81. — Gray, *Wilkes Explor. Exped.* i. 251. — Grisebach, *Fl. Brit. W. Ind.* 126. — Triana & Planchon, *Ann. Sci. Nat.* ser. 4, xviii. 377. — Hemsley, *Bot. Biol. Am. Cent.* i. 214. — Hillebrand, *Fl. Haw. Is.* 85.

[2] Radlkofer (*Sitz. Akad. Münch.* 1878, 221; *Durand Index Generum*, 81) refers many of the species of Sapindus to other genera, reducing the number to ten, with a few doubtful ones. As his paper is an annotated catalogue and not a monograph of the genus, it is not easy to judge of the value of his conclusion with regard to the limitation of genera and species.

[3] Saporta, *Origine Paléontologique des Arbres*, 279.

Sapindus contains a detersive principle which causes the pulp of the fruit, and to a lesser degree the root, to lather freely in water, making them valuable as substitutes for soap. The fruit of the West Indian and Floridian *S. Saponaria* is used by the negroes of the West Indies for washing linen, which, however, it is said to injure and soon destroy.[1] The fruit of several of the South American species is employed for the same purpose. *Sapindus Mukorossi*,[2] a widely distributed tree in southern and eastern continental Asia, and now naturalized in Japan, is generally cultivated in northern and central India for the fleshy pulp of the fruit; it is an important article of trade in the Punjab and northwest provinces, and is preferred to soap for washing flannels and Cashmere shawls, and is also used for washing silk.[3] In India the leaves of this tree serve as fodder for cattle, and in China the roasted fruit is occasionally eaten and the seeds are employed medicinally.[4] *S. trifoliatus*,[5] a native of southern India, is cultivated in Bengal. The fruit of Sapindus possesses a terebinthine and disagreeable flavor; the bark is bitter and astringent, and has been used as a tonic; and the pulverized seeds are said to poison fish.[6] The seeds of several of the species are strung to form chaplets and bracelets, and are sometimes used for buttons.[7]

The generic name, formed from *Sapo* and *Indus*, refers to the detersive properties and use of the first species known to botanists, the *Sapindus Saponaria* of the West Indies; it was established by Tournefort[8] and afterwards adopted by Linnæus.

[1] Oviedo, *Hist. Nat. Gen. Ind.* lib. 9, cap. 5. — Sloane, *Nat. Hist. Jam.* ii. 132. — Macfadyen, *Fl. Jam.* 159. — Radlkofer, *Sitz. Akad. Münch.* 1878, 234.

[2] Gærtner, *Fruct.* i. 341, t. 70. — De Candolle, *Prodr.* i. 609. — Hooker f. *Fl. Brit. Ind.* i. 683. — Franchet & Savatier, *Enum. Pl. Jap.* i. 86. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 139.

[3] Brandis, *Forest Fl. Brit. Ind.* 106.

[4] Smith, *Contrib. Mat. Med. China*, 199.

[5] Linnæus, *Spec.* 367. — Hooker f. *l. c.* 682.

It is this species which is seen about the villages all through southern India. Cleghorn states that its cultivation in favorable situations yields a larger return than that of any other fruit-tree. (*Forests and Gardens of Southern India*, 239.)

[6] Nieremberg, *Hist. Nat.* 368. — Sloane, *l. c.* — Macfadyen, *l. c.*

[7] "The Stone is made Use of for Buttons, and therefore the Berries are gather'd and the Stones sent into *Europe* in great Quantities. The Stone makes better Beads to be used in Prayers than Ebony." (Sloane, *l. c.*)

[8] *Inst.* 659, t. 440.

SAPINDUS SAPONARIA.

Soapberry.

CALYX-LOBES rounded at the apex; petals inappendiculate, short-clawed. Petioles broadly winged.

Sapindus Saponaria, Linnæus, *Spec.* 367. — Swartz, *Obs.* 152. — Willdenow, *Spec.* ii. 468. — Poiret, *Lam. Dict.* vi. 663 (in part). — Lunan, *Hort. Jam.* ii. 177. — Titford, *Hort. Bot. Am.* 61. — Descourtilz, *Fl. Med. Antil.* iv. 121, t. 261. — De Candolle, *Prodr.* i. 607. — Maycock, *Fl. Barb.* 159. — Don, *Gen. Syst.* i. 665. — Spach, *Hist. Veg.* iii. 53. — Macfadyen, *Fl. Jam.* 159. — Rafinesque, *New Fl.* 22. — Nuttall, *Sylva*, ii. 73. — Richard, *Fl. Cub.* ii. 114. — Grisebach, *Fl. Brit. W. Ind.* 126; *Cat. Pl. Cub.* 45. — Baillon, *Hist. Pl.* v. 349, f. 353. — Radlkofer, *Sitz. Akad. Münch.* 1878, 319. — Chapman, *Bot. Gazette*, iii. 3; *Fl. S. States*, Suppl. 613. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 45.

A small tree, sometimes growing to the height of twenty-five or thirty feet, with a trunk which rarely exceeds ten or twelve inches in diameter, and erect branches. The bark of the trunk is from a quarter to half an inch thick, light gray and roughened with oblong lighter colored excrescences, the outer layer exfoliating in large flakes, exposing a nearly black surface. The branchlets are at first slightly many-angled, orange-green, with white lenticular spots; in their second season they become terete, and are then marked with large leaf-scars and covered with pale brown bark slightly tinged with red. The leaves are six or seven inches in length with about four pairs of leaflets, the lower pair being smaller than the others. They appear in Florida in March and April, and remain on the branches until the period of growth the following year. The wings of the petioles, which are narrow and often nearly obsolete below the lowest pair of leaflets, are sometimes nearly half an inch wide below the upper pair; they are broadest above the middle, and are contracted abruptly at the top and gradually at the base. The leaflets, which are opposite or alternate, are elliptical or oblong-lanceolate, acute, rounded, or occasionally somewhat emarginate at the apex, gradually narrowed at the base, and very short-petiolulate. They are three or four inches in length and an inch and a half in breadth, glabrous on the upper surface with the exception of a few hairs along the channel of the midrib when they first appear, softly pubescent on the lower surface, and rather coriaceous at maturity; they are yellow-green, paler below than above, and prominently reticulated, with yellow midribs and primary veins. The panicles, which appear in Florida in November, are terminal and seven to ten inches in length, with an angulate peduncle and branches. The flowers are usually produced three together, and are short-petioled; the calyx-lobes are rounded, concave, and ciliate on the margin, the two outer rather smaller than those of the inner rank; the petals are white, ovate, short-clawed, rounded at the apex, and covered, especially towards their base, with long scattered hairs; the stamens are included or slightly exserted, with hairy filaments broadened at the base. In Florida the fruit ripens in spring or early summer; it is two thirds of an inch in diameter, with thin orange-brown semitranslucent flesh, and black slightly obovate seeds half an inch across, the hilum surrounded with long pale hairs.

Sapindus Saponaria is found in Florida on the shores of Cape Sable, on the shores and islands of Caximbas Bay, on Key Largo, Elliott's Key, and the shores of Bay Biscayne; it is generally distributed through the West Indies, and occurs in Venezuela. In Florida it is most common on Cape Sable, but reaches its greatest development on some of the Thousand Islands.

The wood of *Sapindus Saponaria* is heavy, rather hard, and close-grained. It is light brown tinged with yellow, with thick yellow sapwood, and contains numerous thin medullary rays. The specific gravity of the absolutely dry wood is 0.8367, a cubic foot weighing 52.14 pounds.

The fact that the fruit of this tree was used by the Caribs as a substitute for soap attracted the attention of early travelers in the New World. It was mentioned by Oviedo y Valdes[1] in 1535, and has been noticed and described by nearly all subsequent writers on the natural history and products of the Antilles. It was first discovered in Florida by Dr. J. L. Blodgett.

Sapindus Saponaria, according to Aiton,[2] was cultivated in England by the Duchess of Beaufort in 1697; it was early introduced into Senegambia, and is said to have become naturalized on some of the Cape Verde Islands.[3]

[1] *Arbol de las cuentas del xabon, Hist. Gen. Nat. Ind.* lib. 9, cap. 5. — Nicolas Monardes, *Hist. Med.* ed. Sevilla, 1574, fol. 105. — Clusius, *Exot.* lib. 2, cap. 16. (See also Joanne de Laet, *Nov. Orb.* lib. 5, cap. 21, 260.)

Saponariæ sphærulæ arboris filicifoliæ, J. Bauhin, *Hist. Gen.* i. 312.

Nuculæ saponariæ non edules, C. Bauhin, *Pin.* 511.

"Sope berries like a musket bullet that washeth as white as sope." "Sope berries, the Kernel so big as a sloe, and good to eat." (Smith, *Trav. and Obs.* 55, 56.)

"*De l'arbre qui porte les savonettes.*" (Du Tertre, *Hist. Gen. Antil.* ii. 165.)

Nux Americana, foliis alatis bifidis, Kiggelaer, *Cat. Hort. Beaum.* 31. — Commelin, *Hort.* i. 183, t. 94.

Prunifera sive nuciprunifera, Plukenet, *Phyt.* t. 217, f. 7.

Prunifera racemosa, folio alato, costa media membranulis utrinque extantibus donata, fructu saponario, Sloane, *Cat. Pl. Jam.* 184; *Nat. Hist. Jam.* ii. 131.

Sapindus, Linnæus, *Hort. Cliff.* 152. — Royen, *Fl. Leyd. Prodr.* 464.

The Black Nicker-tree, Hughes, *Natural History of Barbados*, 118.

Sapindus foliis oblongis, vix petiolatis, per costam ample alatam dispositis, Browne, *Nat. Hist. Jam.* 206.

[2] *Hort. Kew.* ed. 2, ii. 424.

[3] Hooker, *Niger Fl.* 249.

Sapindus Saponaria is said by Radlkofer (*Sitz. Akad. Münch.* 1878, 319) to inhabit Polynesia and the Philippine Islands.

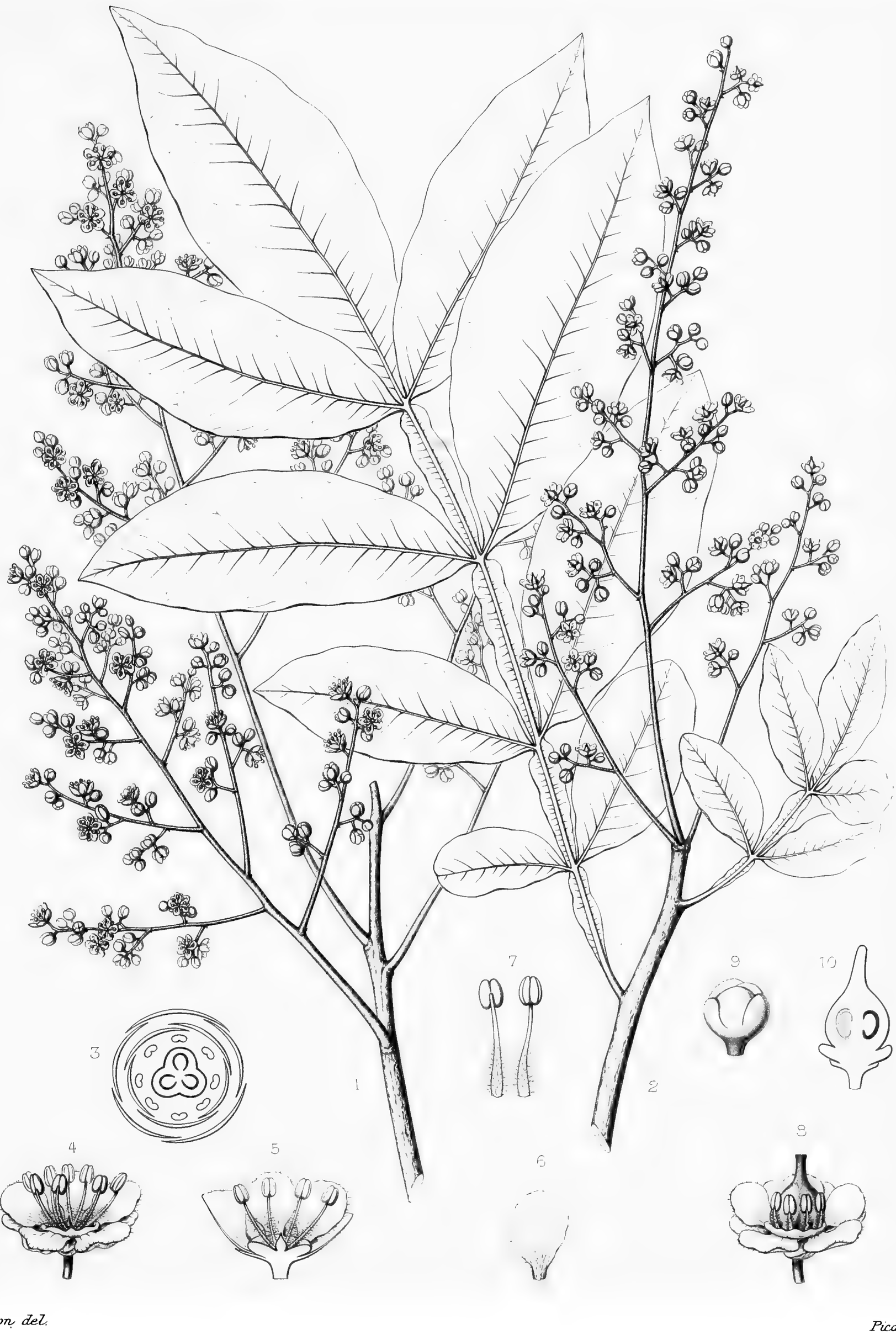
EXPLANATION OF THE PLATES.

Plate LXXIV. Sapindus Saponaria.

1. An inflorescence of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a perfect flower.
4. A staminate flower, enlarged.
5. Vertical section of a staminate flower, enlarged.
6. A petal, enlarged.
7. An anther, rear and front views, enlarged.
8. A perfect flower, enlarged.
9. A flower-bud, enlarged.
10. Vertical section of a pistil, enlarged.

Plate LXXV. Sapindus Saponaria.

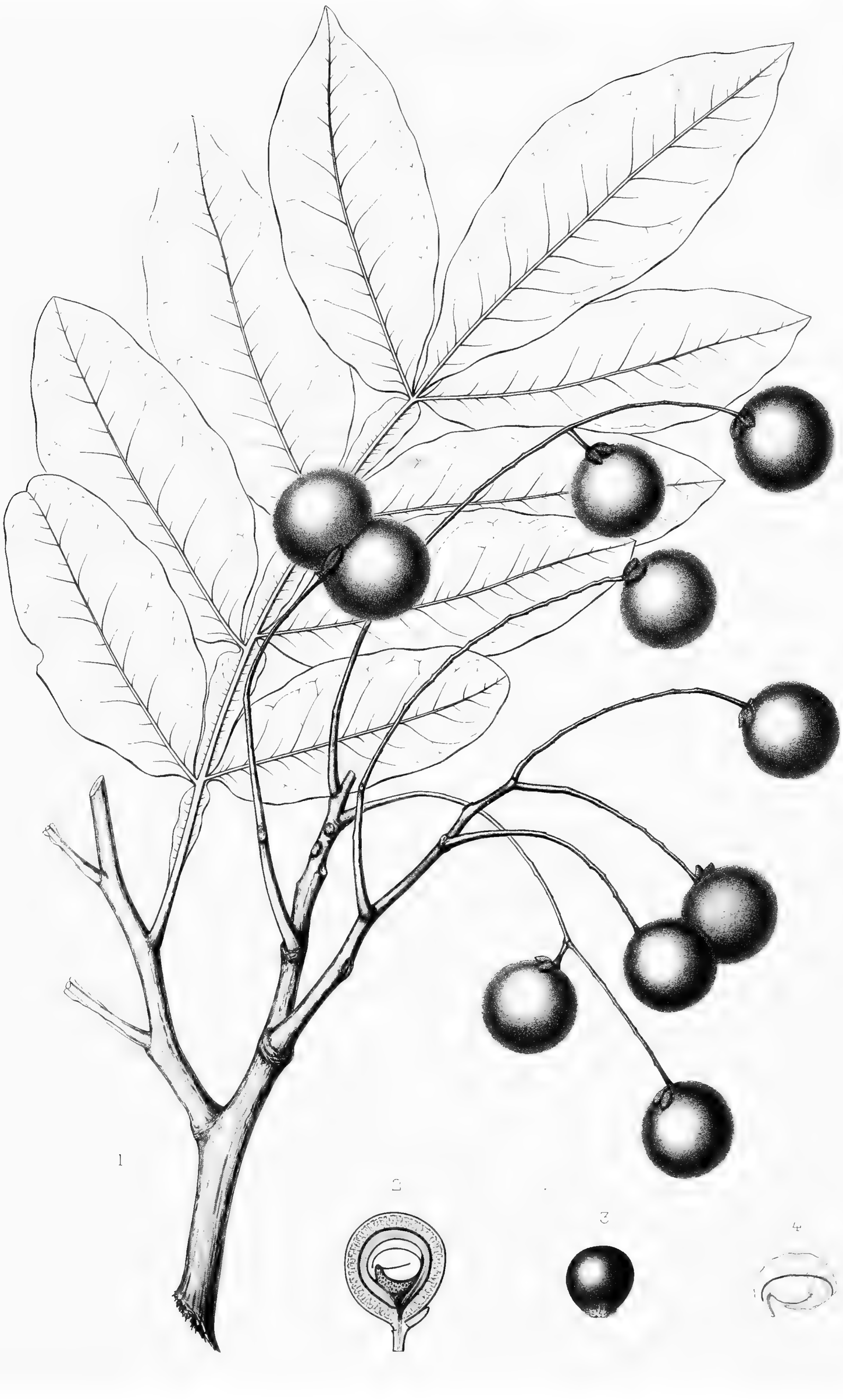
1. A fruiting branch, natural size.
2. Vertical section of a fruit, natural size.
3. A seed, natural size.
4. An embryo, enlarged.



C.E. Faxon del. Picart fr sc.

SAPINDUS SAPONARIA, L.

A. Riocreux direx.t Imp R. Taneur Paris



C. E. Faxon del. Picart fr. sc.

SAPINDUS SAPONARIA. L

A. Riocreux direx.t Imp.R Taneur Paris

SAPINDUS MARGINATUS.

Soapberry. Wild China Tree.

CALYX-LOBES acute; petals appendaged. Petioles wingless or nearly so.

Sapindus marginatus, Willdenow, *Enum.* 432. — Muehlenberg, *Cat.* 41. — De Candolle, *Prodr.* i. 607. — Sprengel, *Syst.* ii. 250. — Don, *Gen. Syst.* i. 665. — Spach, *Hist. Veg.* iii. 54. — Torrey & Gray, *Fl. N. Am.* i. 255, 685; *Pacific R. R. Rep.* ii. 162. — Nuttall, *Sylva*, ii. 72, t. 65. — Engelmann & Gray, *Jour. Bost. Soc. Nat. Hist.* v. 241 (*Pl. Lindheim.* i.). — Gray, *Gen. Ill.* ii. 214, t. 180; *Jour. Bost. Soc. Nat. Hist.* vi. 168 (*Pl. Lindheim.* ii.); *Pl. Wright.* i. 38 (*Smithsonian Contrib.* iii.). — Engelmann, *Wislizenus' Mem.* 96. — Torrey, *Emory's Rep.* 138; *Marcy's Rep.* 269; *Pacific R. R. Rep.* iv. 2, 74; *Bot. Mex. Bound. Surv.* 47. — Schnizlein, *Icon.* t. 230, f. 22. — Chapman, *Fl.* 79. — Hemsley, *Bot. Biol. Am. Cent.* i. 214. — Watson, *Proc. Am. Acad.* xvii. 337. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 44.

S. Saponaria, Lamarck, *Ill.* ii. 441, t. 307 (not Linnæus). — Michaux, *Fl. Bor.-Am.* i. 242. — Poiret, *Lam. Dict.* vi. 663 (in part). — Persoon, *Syn.* i. 444. — Pursh, *Fl. Am. Sept.* i. 274. — Nuttall, *Gen.* i. 257. — Elliott, *Sk.* i. 460. — Torrey, *Ann. Lyc. N. Y.* ii. 172.

S. falcatus, Rafinesque, *Med. Bot.* ii. 261.

S. acuminatus, Rafinesque, *New Fl.* 22. — Radlkofer, *Sitz. Akad. Münch.* 1878, 316, 393. — Watson & Coulter, *Gray's Man.* ed. 6, 116.

S. Drummondi, Hooker & Arnott, *Bot. Voy. Beechey*, 281 (excl. var.). — Walpers, *Rep.* i. 417.

S. Manatensis, Radlkofer, *Sitz. Akad. Münch.* 1878, 318, 400 (Shuttleworth in *Herb. Rugel*).

A tree, forty or fifty feet in height, with a trunk sometimes a foot and a half or two feet in diameter, stout, usually erect branches and minute depressed globular winter-buds. The bark of the trunk, which is from a third to half an inch thick, separates by deep fissures into long narrow flakes, their surface breaking into small red-brown scales. The branchlets when they appear are slightly many-angled, pale yellow-green, and clothed with pubescence. In the second year they are terete, with large conspicuously elevated leaf-scars, and are covered with pale gray and usually slightly puberulous bark, marked with numerous small lenticels. The leaves are composed of four to nine pairs of leaflets borne on slender grooved puberulous petioles sometimes a little winged towards the upper end. They appear in March and April, and fall in the autumn or early winter. The leaflets are alternate, obliquely lanceolate, and sharply acuminate; on the upper surface they are glabrous and on the lower are usually covered with short pale pubescence, although in some Florida forms they are nearly smooth;[1] they are short-petiolulate, rather coriaceous, prominently reticulated, pale yellow-green, two to three inches long and a half to two thirds of an inch broad. The inflorescence, which appears in May or June, is six to nine inches in length and five or six inches in breadth, with a pubescent many-angled stem and branches. The sepals are acute and concave, with ciliate margins, and are much shorter than the white obovate petals, which are rounded at the apex and contracted into a long claw hairy on the inner surface and furnished at the top with a deeply cleft scale with hairy margins. The stamens of the sterile flower are exserted, while those of the fertile flower are barely half the length of the petals; the filaments are slightly thickened at the base, and are furnished with long soft hairs. The fruit ripens in September and October and remains on the branches until the following spring or summer. The berries are ovate or rounded, and half an inch in diameter, with thin dark orange-colored semitranslucent flesh and obovate dark brown seeds, the hilum surrounded by a tuft of pale hairs.

Sapindus marginatus grows along the Atlantic coast from the valley of the Savannah River in Georgia to that of the St. John's River in Florida; and on the west coast of Florida from Cedar Keys to the Manatee River. It reappears west of the Mississippi River and extends from western Louisiana

[1] As collected by Rugel near the mouth of the Manatee River; the *S. Manatensis* of Shuttleworth and of Radlkofer.

to the valley of the Washita River in southern Arkansas and to southern Kansas, through Texas to the mountain valleys of southern New Mexico and southern Arizona, and into northern Mexico. On the Atlantic coast it is a small tree, rarely exceeding twenty feet in height, and is not common; it is most abundant and reaches its greatest size along the river bottoms of eastern Texas, where it grows in company with the White Elm, the Texas Elm, the Honey Locust, and the Hackberry, or often occupies considerable areas to the exclusion of other trees. It prefers moist clay soil, although it sometimes grows on dry limestone uplands.

The wood of *Sapindus marginatus* is heavy, strong, and close-grained, with several rows of large open ducts clearly marking the layers of annual growth, and thin obscure medullary rays. It is light brown tinged with yellow, with lighter colored sapwood composed of about thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.8126, a cubic foot weighing 50.64 pounds. It splits easily into thin strips, and is largely employed in Texas in the manufacture of baskets used in harvesting cotton, and in New Mexico for the frames of pack-saddles. The fruit is eaten in Texas by cattle and deer.

Sapindus marginatus was discovered by the French botanist Michaux on the coast of Georgia, and was first described by Lamarck, who confounded it with the West Indian *S. Saponaria.* It is now occasionally cultivated in the gardens of southern Europe and in Algeria.[1]

[1] Naudin, *Manuel de l'Acclimateur*, 487.

EXPLANATION OF THE PLATES.

PLATE LXXVI. SAPINDUS MARGINATUS.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A petal, enlarged.
6. A stamen, rear and front views, enlarged.
7. A pistillate flower, enlarged.
8. Vertical section of a pistillate flower, enlarged.
9. A pistil cut transversely, enlarged.
10. Vertical section of a pistil, enlarged.
11. An ovule, much magnified.

PLATE LXXVII. SAPINDUS MARGINATUS.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, slightly enlarged.
3. A seed, natural size.
4. An embryo, natural size.
5. A winter-branchlet, natural size.

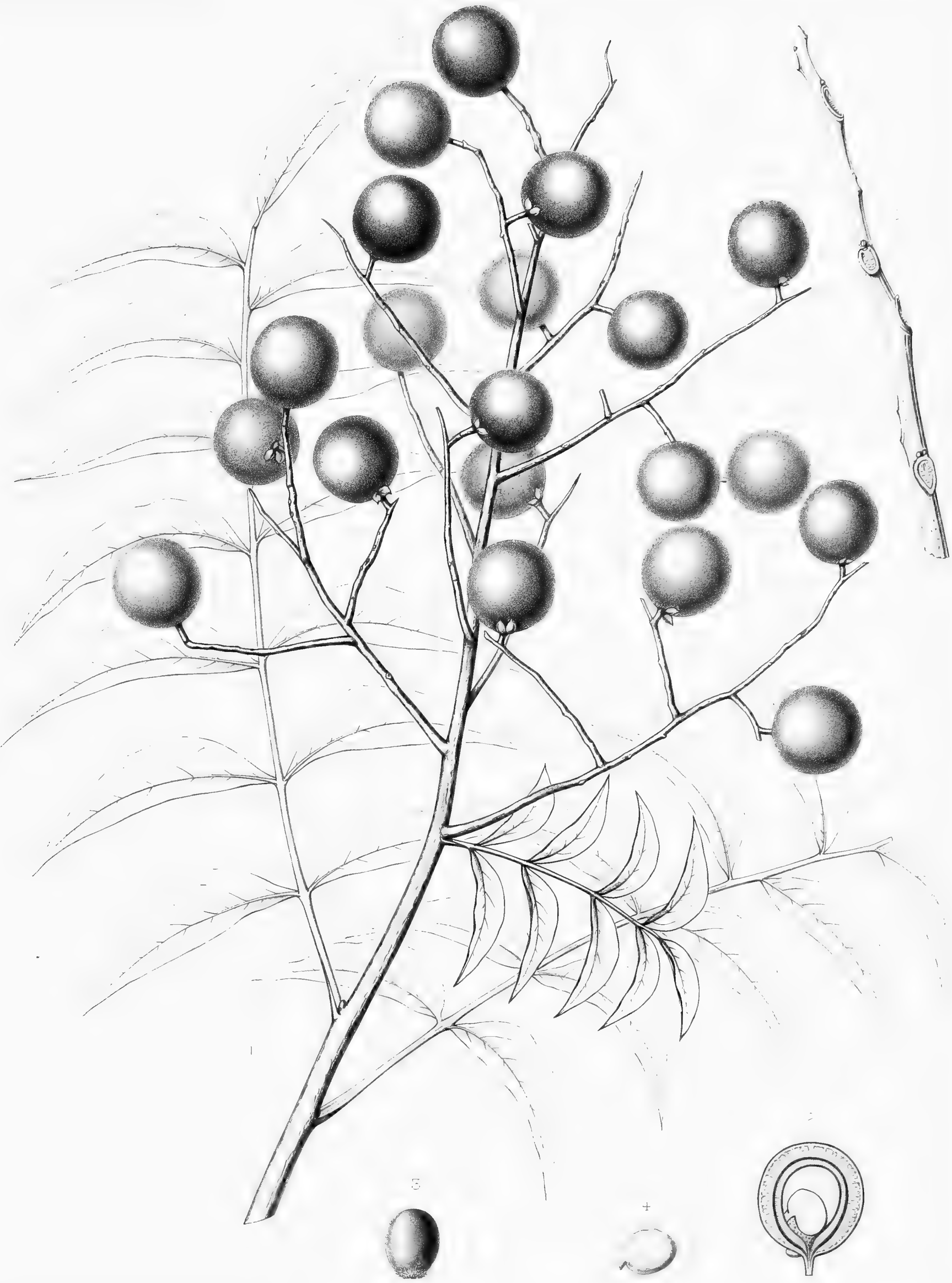
C. E. Faxon del

Picart fr sc

SAPINDUS MARGINATUS, Willd

A. Riocreux direx.t

Imp R. Taneur. Paris



C.E Faxon del Picart fr. sc.

SAPINDUS MARGINATUS, Willd

A. Riocreux direx.t Imp R. Taneur, Paris.

EXOTHEA.

FLOWERS regular, polygamo-diœcious; sepals 5, imbricated in æstivation; petals 5, imbricated in æstivation; ovary 2-celled; ovules 2 in each cell, suspended. Fruit baccate, by abortion 1-seeded.

Exothea, Macfadyen, *Fl. Jam.* 232. — Endlicher, *Gen.* 1134. — Meisner, *Gen.* 349.
Melicocca, A. L. de Jussieu, *Mém. Mus.* iii. 178 (in part).
Hypelate, Cambessedes, *Mém. Mus.* xviii. 31 (in part). — Bentham & Hooker, *Gen.* i. 408 (in part). — Baillon, *Hist. Pl.* v. 408 (in part).

A tree, with thin scaly bark and terete branchlets covered with lenticels. Leaves alternate, petiolate, abruptly pinnate, or three or rarely one-foliolate, glabrous, persistent, destitute of stipules; leaflets oblong or oblong-ovate, acute, rounded, or emarginate at the apex, with entire undulate margins, obscurely veined, membranaceous, dark green and lustrous on the upper, and slightly paler on the lower surface. Flowers small, in ample terminal or axillary wide-branched panicles, the peduncle and branches clothed with orange-colored pubescence. Pedicels short from the axils of minute deciduous bracts, and covered, like the flower-buds, with thick pale tomentum. Sepals ovate, rounded at the apex, ciliate on the margins, puberulous, persistent. Petals white, ovate, rounded at the apex, shortly unguiculate, alternate with and rather longer and narrower than the sepals. Disk annular, fleshy, irregularly five-lobed, puberulous. Stamens seven or eight, inserted on the disk, in the sterile flower as long as the petals, much shorter in the fertile flower; filaments filiform, glabrous; anthers oblong, introrse, attached at the base, two-celled with a broad connective, the cells opening longitudinally; rudimentary in the staminate flower. Ovary sessile on the disk, conical, pubescent, contracted into a short thick style; rudimentary in the sterile flower; stigma large, declinate, obtuse; ovules two in each cell, suspended from the summit of the inner angle, anatropous, collateral; raphe ventral; micropyle superior. Fruit a nearly spherical one-seeded berry, containing the rudiment of the second cell, and tipped with the short remnant of the style, the base surrounded by the persistent reflexed sepals; pericarp thick, dark purple, and juicy at maturity. Seed oblong, solitary, suspended, destitute of albumen; testa thin, coriaceous, orange-brown, and lustrous; embryo subglobose, filling the cavity of the seed; cotyledons fleshy, plano-convex, puberulous; radicle superior, very short, uncinate, turned towards the hilum and inclosed in a lateral cavity of the testa.

The wood of Exothea is very hard and heavy, strong and close-grained, and capable of receiving a beautiful polish, although liable to check badly in drying. It is bright red-brown, with lighter colored sapwood composed of ten or twelve layers of annual growth and obscure medullary rays. The specific gravity of the absolutely dry wood is 0.9533, a cubic foot weighing 59.41 pounds. It resists the attacks of the Teredo and is therefore valuable for piles; it is also used in Florida in boat-building, for the handles of tools, and for many small objects.

The generic name, derived from ἐξωθέω, to expel, was bestowed upon it by Macfadyen[1] when he

[1] James Macfadyen (1800–1850) was born in Glasgow where he studied botany under Sir William Hooker and was graduated from the School of Medicine in 1821. He was selected on the recommendation of Hooker to organize a government Botanical Garden in Jamaica. This he did, but the garden languished, and Macfadyen soon retired from its direction and established himself on the island as a physician. He did not, however, abandon the study of botany, and in 1837 published the first volume of his *Flora of Jamaica* (*Ranunculaceæ* to *Leguminosæ*), a work which contains, as far as completed, the best account of the plants, and especially of the trees, of the island, which has been published. A second volume was written and printed in Kingston but never published, the author's career being suddenly ended by cholera which he contracted while zealously devoting himself to his professional duties. *Macfadyena*, a large genus of tropical American *Bignoniaceæ*, was dedicated to him by A. de Candolle. (See *Proc. Linn. Soc.* ii. 135.)

separated it from the group of plants with which he supposed it to be allied. The genus is represented by one or perhaps two species.[1]

[1] Radlkofer (*Sitz. Akad. Münch.* xx. 276) distinguishes a second species of Exothea, *E. Copalillo* ("Copalillo," Schlechtendal, *Linnæa*, vi. 419. *Ratonia* sp., Hemsley, *Bot. Biol. Am. Cent.* i. 213), but I have never seen it.

EXOTHEA PANICULATA.

Iron Wood. Ink Wood.

Exothea paniculata, Radlkofer, *Durand Index Generum*, 81; *Sitz. Akad. Münch.* xx. 276. — Sargent, *Garden and Forest*, iv. 100.

Melicocca paniculata, A. L. de Jussieu, *Mém. Mus.* iii. 187, t. 5. — De Candolle, *Prodr.* i. 615. — Dietrich, *Syn.* ii. 1278. — Nuttall, *Sylva*, ii. 74, t. 65.

Hypelate paniculata, Cambessedes, *Mém. Mus.* xviii. 32. — Don, *Gen. Syst.* i. 671. — Richard, *Fl. Cub.* ii. 122. — Grisebach, *Fl. Brit. W. Ind.* 127. — Chapman, *Fl.* 79. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 45.

Sapindus lucidus, Hamilton, *Prodr. Pl. Ind. Occ.* 36 (teste Radlkofer, *l. c.*).

E. oblongifolia, Macfadyen, *Fl. Jam.* 232. — Hooker, *London Jour. Bot.* iii. 227, t. 7.

The Exothea sometimes grows in Florida to the height of forty or fifty feet, with a tall trunk twelve or fifteen inches in diameter and slender upright branches. The bark of the trunk is from an eighth to a quarter of an inch thick, with a bright red surface separating into large brown scales. The branchlets are orange-brown when they first appear, becoming red-brown in their second year, and are thickly covered with small white lenticels. The leaves, which are borne on stout grooved petioles half an inch to nearly an inch in length, appear in Florida in April; the leaflets are four or five inches long and an inch and a half or two inches broad. The panicles of sterile and of fertile flowers are produced on separate plants. The flowers open in Florida in April, and are half an inch across when expanded. The fruit is fully grown by the end of June, and is then dull orange-colored; it remains on the branches during the summer and ripens in the autumn, when it is juicy and dark purple.[1]

The Exothea is found in Florida from Mosquito Inlet on the east coast to the southern keys, where it is generally distributed, but is nowhere a common tree. It also inhabits San Domingo, Cuba, and Jamaica. It was discovered in San Domingo early in the century by the French botanist Poiteau,[2] and was first noticed in Florida by Dr. J. L. Blodgett.

[1] According to Richard, the fruit of *Exothea paniculata* is devoured in Cuba by hogs and other domestic animals. (*Fl. Cub.* ii. 122.)

[2] Alexandre Poiteau (1766–1850) was one of the most famous gardeners of his time. Born at Amblecy near Soissons, he learned botany and gardening in the Jardin des Plantes in Paris, and so distinguished himself that he was soon sent to organize a rural institution in the Dordogne, and then in 1793 to Hayti, where he was made director of the recently established botanical garden. Poiteau returned to Paris in 1802, carrying with him many plants and seeds, and was placed in charge of the royal nursery-gardens at Versailles; in 1815 he was sent to America again to take charge of the Government Gardens in French Guiana, in which position he remained until 1821. Returning to France he was made successively head gardener at Fontainebleau, of the gardens of the École de Médicine, and of the Jardin des Plantes in Paris. Poiteau discovered many new plants in America; and was particularly successful in his efforts in improving different fruits. He was the author of many works of importance, including *Le Jardin Botanique de l'École de Médicine de Paris* (1816); *Histoire des Palmiers de la Guayne Française* (1822); *Voyageur Botaniste* (1829); *Pomologie Française* (1839); *Cour d'Horticulture* (1847–48); and with Risso, *Histoire Naturelle des Oranges*. Some of the volumes of the *Bon Jardinier* were edited by him; and he contributed articles to scientific periodicals. *Poitæa*, a genus of leguminous plants of the Antilles, was established by Ventenat.

EXPLANATION OF THE PLATES.

Plate LXXVIII. Exothea paniculata.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. A stamen, front and rear views, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of a pistillate flower, enlarged.
8. A pistil cut transversely, enlarged.
9. An ovule, much magnified.

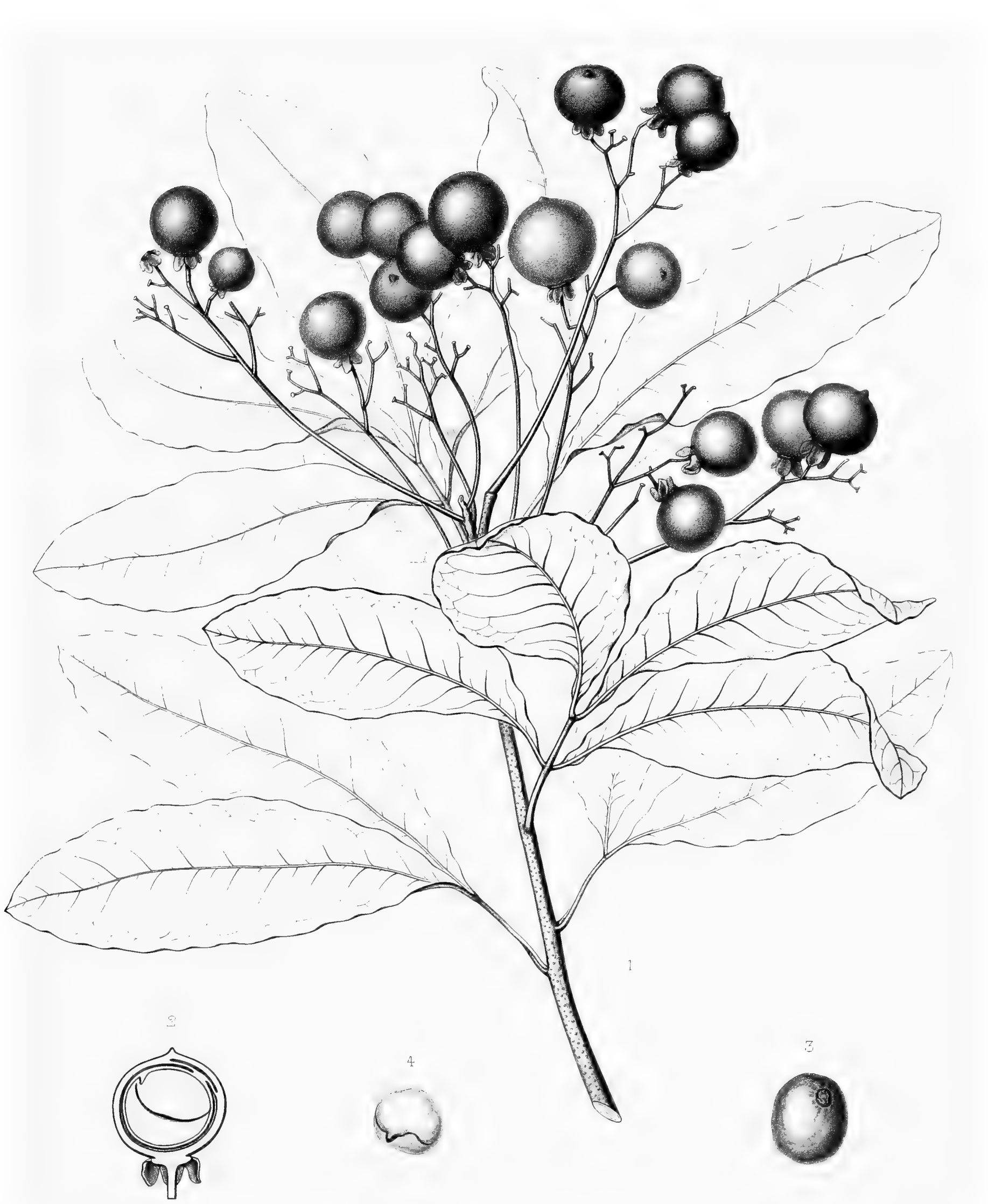
Plate LXXIX. Exothea paniculata.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, slightly enlarged.
3. A seed, enlarged.
4. An embryo, enlarged.

E Faxon del. Picart fr. sc

EXOTHEA PANICULATA. Radlk

A. Riocreux direx.t Imp. R. Taneur, Paris.



C. E. Faxon del

Picart fr. sc.

EXOTHEA PANICULATA, Radlk.

A. Riocreux direct

Imp. R. Taneur, Paris.

HYPELATE.

FLOWERS regular, polygamo-monœcious; calyx 5-lobed, the lobes imbricated in æstivation, deciduous; petals 5, imbricated in æstivation; ovary 3-celled; ovules 2 in each cell, heterotropous. Fruit a fleshy drupe, 1-celled, 1-seeded.

Hypelate, Browne, *Nat. Hist. Jam.* 208. — Cambessedes, *Mém. Mus.* xiii. 31 (in part). — Endlicher, *Gen.* 1071 (in part). — Meisner, *Gen.* 53. — Bentham & Hooker, *Gen.* i. 408 (in part). — Baillon, *Hist. Pl.* v. 408 (in part).

Melicocca, A. L. de Jussieu, *Mém. Mus.* iii. 178 (in part; not Linnæus).

A glabrous tree or shrub, with smooth bark and slender terete branches. Leaves alternate, long-petiolate, the petioles sometimes narrow winged, destitute of stipules, three-foliolate, the terminal leaflet rather larger than the others, persistent; leaflets sessile, obovate, rounded or rarely acute or emarginate at the apex, entire with thickened revolute margins and prominent midribs, coriaceous, conspicuously feather-veined, the veins arcuate and connected near the margin, dark green and lustrous on the upper, and bright green on the lower surface. Flowers minute, in few-flowered long-stemmed wide-branched terminal or axillary panicles. Pedicels slender from the axils of minute deciduous bracts. Calyx-lobes ovate, rounded at the apex, slightly puberulous on the outer surface, ciliate along the margins, deciduous by a circumscissile line. Petals rather longer than the calyx-lobes, rounded, spreading, white, with ciliate margins. Stamens seven or eight, inserted on the lobes of the annular fleshy disk; filaments filiform, in the sterile flower as long as the petals, much shorter in the fertile flower; anthers oblong, attached on the back near the bottom, two-celled, the cells spreading from above downwards, opening longitudinally. Ovary sessile on the disk, slightly three-lobed, three-celled, contracted into a short stout style; rudimentary in the sterile flower; stigma large, declinate, obscurely three-lobed; ovules two in each cell, borne on the middle of its inner angle, amphitropous, superposed, the upper ascending with the micropyle inferior, the lower pendulous with the micropyle superior. Fruit an ovate black drupe, crowned with the remnants of the persistent style and supported on the persistent base of the calyx; sarcocarp thin and fleshy; endocarp thick and crustaceous. Seed destitute of albumen, solitary by the abortion of the upper ovule, suspended, obovate; testa thin, slightly wrinkled. Embryo conduplicate, filling the cavity of the seed; cotyledons thin, foliaceous, irregularly folded, incumbent on the long radicle.

The wood of Hypelate is very heavy, hard, and close-grained. It contains numerous thin obscure medullary rays, and is rich dark brown in color with thin darker colored sapwood usually composed of four or five layers of annual growth. It is durable in contact with the soil, and is valued in Florida for posts; it is also used in ship-building and for the handles of tools.

Hypelate, the ancient name of the Butcher's Broom, *Ruscus Hypophyllum* of Linnæus, was adopted by Patrick Browne as the generic name for the West Indian tree. The genus is represented by a single species.

HYPELATE TRIFOLIATA.

White Iron Wood.

Hypelate trifoliata, Swartz, *Fl. Ind. Occ.* ii. 655, t. 14. — Lunan, *Hort. Jam.* i. 387. — Delessert, *Icon.* iii. 23, t. 39. — De Candolle, *Prodr.* i. 614. — Macfadyen, *Fl. Jam.* 163. — Dietrich, *Syn.* ii. 1279. — Chapman, *Fl.* 78. — Grisebach, *Fl. Brit. W. Ind.* 127; *Cat. Pl. Cub.* 46. — Sargent, *Garden and Forest*, iv. 100.

Amyris Hypelate, Robinson; Lunan, *Hort. Jam.* i. 149.

A tree, rising sometimes in Florida to the height of thirty-five or forty feet, with a trunk occasionally eighteen or twenty inches in diameter, although generally much smaller. The bark, which is smooth, is rarely an eighth of an inch in thickness and is marked with many shallow depressions and minute lenticels. The branchlets are pale green when they first appear; they become gray later in the season, and bright red-brown in the second year. The leaves unfold in Florida in June and remain on the branches until the second season and often longer. They are borne on stout petioles one and a half to two inches long, furnished with narrow green wings. The leaflets are one and a half to two inches long, three quarters of an inch to an inch and a quarter wide, and very bright green. The inflorescence is few-flowered, and is three or four inches in length, with a slender peduncle and branches. The sterile and fertile flowers are produced in separate panicles on the same tree. The flowers appear in Florida in June, and when fully expanded are a little less than an eighth of an inch across. The fruit, which is produced very sparingly, ripens in September; it is three eighths of an inch long and possesses a sweet rather agreeable flavor.

Hypelate trifoliata is known in Florida only on Upper Metacombe and Umbrella Keys, and is one of the rarest of the tropical trees which occur within the territory of the United States. It also inhabits Jamaica and Cuba.

Hypelate trifoliata was discovered in Jamaica by Sir Hans Sloane, and the earliest account of it appears in his Catalogue of the Plants of Jamaica published in 1696.[1] It was first found in Florida by Dr. J. L. Blodgett.

[1] *Cytisus arboreus, foliis obtusis glabris, foliorum pediculis alatis*, 141; *Nat. Hist. Jam.* ii. 33. — Ray, *Hist. Pl.* iii. 473. The figure in the *Natural History of Jamaica*, to which Sloane himself refers, represents another plant.

Fruticosa, foliis obovatis pinnato-ternatis, petiolo marginato affixis, Browne, *Nat. Hist. Jam.* 208.

EXPLANATION OF THE PLATES.

PLATE LXXX. HYPELATE TRIFOLIATA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A staminate flower, enlarged.
4. A stamen, back and front views, enlarged.
5. A pistillate flower, enlarged.
6. A pistil divided transversely, enlarged.
7. Vertical section of a pistil, enlarged.
8. A pair of ovules, much magnified.

PLATE LXXXI. HYPELATE TRIFOLIATA.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. A fruit cut transversely, enlarged.
4. A seed, enlarged.

5, 6. An embryo, much magnified.

C. E. Faxon del. Picart fr. sc.

HYPELATE TRIFOLIATA, Sw

A. Riocreux direx t Imp R. Taneur, Paris.

C.E Faxon del *Picart fr sc*

HYPELATE TRIFOLIATA, Sw.

A Riocreux direx.t *Imp.R Taneur Paris*

ACER.

FLOWERS regular, diœciously or monœciously polygamous, rarely perfect, or diœcious; calyx generally 5-parted, the lobes imbricated in æstivation; petals usually 5, imbricated in æstivation, or 0; ovary 2-celled; ovules 2 in each cell, ascending. Fruit a double samara.

Acer, Linnæus, *Gen.* 112. — Adanson, *Fam. Pl.* ii. 383. — A. L. de Jussieu, *Gen.* 251. — Endlicher, *Gen.* 1056. — Meisner, *Gen.* 56. — Gray, *Gen. Ill.* ii. 199. — Bentham & Hooker, *Gen.* i. 409. — Baillon, *Hist. Pl.* v. 427.

Negundo, Moench, *Meth.* 334. — Endlicher, *Gen.* 1056. — Meisner, *Gen.* 56. — Gray, *Gen. Ill.* ii. 201. — Bentham & Hooker, *Gen.* i. 409.

Negundium, Rafinesque, *N. Y. Med. Rep.* hex. 2, v. 350.

Trees or rarely shrubs, with limpid or sometimes milky juice, terete branches, scaly buds, the inner scales often accrescent with the young shoots, and fibrous roots. Leaves opposite, long-petiolate, simple, palmately three to seven-lobed, or rarely entire, or pinnately three to five-foliolate, generally destitute of stipules, deciduous. Flowers in fascicles produced from separate lateral buds and appearing before the leaves, or in terminal and lateral racemes or panicles appearing with or later than the leaves. Bracts minute, usually caducous. Calyx colored, four to twelve, usually five-parted or lobed, deciduous. Petals as many as the lobes of the calyx, inserted on the margin or base of the disk, equal, erect, colored like the calyx, deciduous; or wanting. Disk annular, fleshy, more or less lobed, with a free margin, or rarely rudimentary. Stamens four to ten, usually eight, inserted on the summit or inside of the disk, hypogynous or perigynous; filaments distinct, filiform, commonly exserted in the sterile, shorter and generally abortive in the fertile flower; anthers oblong or linear, attached at the base, introrse, two-celled, the cells opening longitudinally. Ovary two-lobed, two-celled, compressed contrary to the dissepiment, wing-margined on the back; styles two, inserted between the lobes of the ovary, connate below and divided into two linear branches stigmatose on their inner surface; ovules two in each cell, collateral, rarely superposed, ascending, attached by their broad bases to the inner angle of the cell, anatropous or finally amphitropous; micropyle inferior. Fruit composed of two samaras separable from a small persistent axis, the nut-like carpels compressed laterally, produced on the back into a large chartaceous or coriaceous reticulated wing thickened on the lower margin. Seeds solitary by abortion or rarely two in each cell, compressed or irregularly three-angled, ascending obliquely, destitute of albumen; testa membranaceous, the inner coat often fleshy.[1] Embryo conduplicate; cotyledons thin, foliaceous or coriaceous, irregularly plicate, incumbent, oblique, or accumbent on the elongated descending radicle which is turned towards the hilum.[2]

The genus Acer is represented in all the great geographico-botanical divisions of the northern hemisphere, but extends south of the equator only to the mountains of Java.[3] In the eastern and

[1] The seed of Acer usually ripens in the autumn and germinates the following spring. The seed of the two American species with precocious flowers, however, ripens at the end of a few weeks after the trees flower, and germinates at once. This is a provision, perhaps, acquired by these species to insure their perpetuation; they grow in low wet land, often inundated during the winter, and the seed, if it ripened in the autumn, would often lie in water through the winter and be in danger of losing its vitality; but it reaches the ground after the water has fallen in the swamps and before the exposed surface of the ground has become baked by the hot sun of summer, that is when it is in just the condition to insure the germination of seed.

[2] The genus may be divided into two sections as proposed by Maximowicz (*Bull. Acad. Sci. St. Pétersbourg*, xxvi. 437, 450 [Mél. Biol. x. 591, 609]).

ACER. Flowers polygamous or diœcious, petalous or apetalous. Leaves simple.

NEGUNDO. Flowers diœcious, apetalous (in the American species) or furnished with petals. Leaves pinnately or ternately divided.

[3] Acer appears to have been unrepresented in the Tertiary Arctic flora, and to have been rare in that of Greenland. (Heer, *Fl. Foss. Arct.* vii. *Die tert. Fl. v. Groenl.* 125, t. 94, f. 1–3.) It was more abundant in Spitzbergen at the same epoch (Heer, *Fl. Foss. Arct.*

central parts of the continents species are more multiplied than in the western parts, and are common and characteristic features of vegetation.

Sixty or seventy species may be distinguished,[1] nearly half of them belonging to China and Japan,[2] which must be considered the headquarters of the genus.[3] One widely distributed species of southern India is found in Sumatra and Java;[4] twelve are endemic to the Himalaya-mountain region,[5] and twelve to Europe and the Orient.[6] In North America nine species occur; five of these belong to the Atlantic and two to the Pacific region; one is peculiar to the central mountain ranges, and one extends across the continent.

The wood of Acer is light, close-grained, and moderately hard. The bark is astringent and yields red and yellow coloring matter,[7] and the limpid sweet sap of some of the American species is manufactured into sugar. The most valuable timber trees of the genus are the European *Acer Pseudo-Platanus*,[8] the American *A. barbatum*, and the Indian *A. Campbellii*.[9] In Japan the wood of Acer is little employed, although that of *A. pictum*[10] sometimes serves for the interior finish of buildings; a few species supply material for turnery and for making trays and other small objects, and the mucilaginous inner bark of *A. crataegifolium*[11] is used in paper-making.

Acer contains several species which have been planted for centuries as ornamental trees in Europe; and in North America and Japan,[12] where the brilliant colors assumed by the foliage of many Maples increase their value.

iv. *Spitzbergen*, 86, t. 22–24, 25, f. 1–3), so that it probably existed in polar regions before its appearance in central Europe, where the early vestiges of Acer date only from the upper Eocene. (Saporta, *Origine Paléontologique des Arbres*, 281.)

[1] Dr. Ferdinand Pax, in his recent Monograph of Acer (*Engler Bot. Jahrb.* vii. 177), distinguishes more than eighty species. As, however, he sometimes establishes species on single herbarium specimens without flower or fruit, his views will be accepted with caution in the case of a genus in which individuals and even parts of individuals show such a tendency to leaf variation; and the species of Acer, if they are all ever studied in the field, will perhaps be found to be nearer sixty than eighty in number.

[2] Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 437 (Mél. Biol. x. 591). — Franchet & Savatier, *Enum. Pl. Jap.* i. 87. — Franchet, *Pl. David.* 176, 230; *Pl. Delavayanæ*, i. 144, t. 31. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 140.

[3] Dr. Heinrich Mayr estimates that fully thirty per cent. of the deciduous forests of Japan are composed of different species of Maple.

[4] *Acer niveum*, Blume, *Rumphia*, iii. 193, t. 167, B, f. 1. — Miquel, *Fl. Ind. Bat.* i., ii. 582.

[5] Hooker f. *Fl. Brit. Ind.* i. 692.

[6] Nyman, *Conspect. Fl. Europ.* 135. — Boissier, *Fl. Orient.* i. 947.

[7] Le Maout & Decaisne, *Trait. Gén. Bot.* English ed. 356.

[8] Linnæus, *Spec.* 1054. — *Fl. Dan.* t. 1575. — Reichenbach, *Icon. Fl. Germ.* v. t. 164.

The wood of *Acer Pseudo-Platanus* is compact and firm without being very hard; it is easily worked and does not warp or shrink when properly seasoned. It is much used in central Europe in turnery and wood-sculpture, and in the manufacture of trays, violins, and other musical instruments, and of rollers, spoons, plates, pestles, and many other small household utensils. It has a high fuel value, both in the quantity of the heat it produces and in the length of time it burns. The leaves, gathered green and dried, are used as winter fodder for sheep in some parts of Europe.

[9] Hooker f. *Fl. Brit. Ind.* i. 696. *Acer Campbellii* is the principal Maple of the northeastern Himalaya, where the wood is used in large quantities for planking and in the manufacture of tea-boxes. (Gamble, *Man. Indian Timbers*, 101.)

[10] Thunberg, *Fl. Jap.* 162. — Franchet & Savatier, *Enum. Pl. Jap.* i. 87. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 443 (Mél. Biol. x. 599). — Hooker f. *Fl. Brit. Ind.* i. 696. In India, where *A. pictum* is also widely distributed from the Indus to Assam, and is the most common species of the northern Himalaya, its wood is used for construction and in the manufacture of plows and other articles; and its branches are cut for the winter fodder of cattle. (Gamble, *Man. Indian Timbers*, 101.)

[11] Siebold & Zuccarini, *Abhand. Akad. Münch.* iv. 2, 155; *Fl. Jap.* ii. 84, t. 147. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 441 (Mél. Biol. x. 596).

[12] *Acer palmatum* (Thunberg, *Fl. Jap.* 162. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 448 [Mél. Biol. x. 607]), *Acer Japonicum* (Thunberg, *l. c.* 162. — Maximowicz, *l. c.* 605), both in many forms, and *A. diabolicum* (Miquel, *Prol. Fl. Jap.* 20. — Maximowicz, *l. c.* 593), are the most commonly cultivated Maple-trees in the gardens of Japan, in which they are considered indispensable; and the last holiday excursion of the year is made late in the autumn by the Japanese lover of nature to look on the brilliant colors of *A. polymorphum*. (Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung dargestellt*, ii. 325.)

As a general rule the European Maples which have been planted in the United States have not proved long-lived or handsome trees. The exception is the Norway Maple (*Acer platanoides*), which flourishes here, especially in the neighborhood of the ocean, as well as any of the indigenous species, reproducing itself naturally and abundantly. *Acer Pseudo-Platanus*, the most stately and beautiful of the European Maples, and one of the most beautiful trees of the genus when it grows in the mountain valleys of central Europe, fails to become a large or long-lived tree in the United States; and none of the Asiatic species which have been planted here appear capable of adapting themselves permanently to the climate.

Acer is attacked by a number of injurious insects,[1] and is affected, although not very seriously, by various fungal diseases.[2]

Acer, the classical name of the Maple-tree, was adopted for the genus by Tournefort,[3] and afterwards by Linnæus.

[1] The Maples are liable to serious injury from the attacks of several species of wood-boring insects which are particularly destructive to trees planted for shade or ornament, or growing in open sunny woods. In America and in Europe the different species are injured by many insects. Packard has found thirty-six species (*Bull.* No. 7, *U. S. Entomolog. Comm.* 103), which probably represent but a small proportion of those living upon Maple-trees in this country; while Kaltenbach has enumerated no less than sixty-six found on these trees in Germany alone (*Die Pflanzen-feinde aus der Classe der Insecten*, 87). The large Sugar Maple borer (*Glycobius speciosus*) is one of the most dangerous beetles which infest these trees in this country, often causing their death (Harris, *Insects Injurious to Vegetation*, ed. 2, 101), and the flat-headed Apple-tree borer (*Chrysobothris femorata*, F.) is sometimes hardly less injurious to the Red and Silver Maples (Riley, 1*st Ann. Rep. Insects of Missouri*, 1869, 46). The boring larvæ of a small moth (*Ægeria acerni*, Clemens) is often very destructive to the Red and Sugar Maples, and is especially abundant in some parts of the west. (Riley, 6*th Ann. Rep. Insects of Missouri*, 1874, 107.) The foliage of all the species of eastern America is more or less liable to injury by the common Fall Web-worm, and Silver Maples planted in New England cities are sometimes much injured by the larvæ of the Tussock moth.

The caterpillar of *Dryocampa rubicunda*, F., sometimes destroys the Red and Silver Maples in some parts of the west (Riley, 5*th Ann. Rep. Insects of Missouri*, 1873, 137); and many other leaf-eating and some leaf-mining insects affect the Maples of the United States, although their ravages have rarely been serious enough to attract general attention.

Aphids quite frequently infest Maple-trees, and the scale insect known as the Cottony Maple Scale (*Pulvinaria innumerabilis*, Rathvon) is often exceedingly troublesome and destructive. (J. D. Putnam, *Proc. Davenport Acad.* ii. 293.)

Acer Negundo, besides being liable to injury by the boring and foliage-eating insects which prey on the other Maples, is peculiarly liable to defoliation by the Fall Web-worm (*Bull.* 10, *Div. Ent. Dep. Agric.* 1887, 40); and the Box Elder bug (*Leptocoris trivittatus*) is reported as seriously affecting the growth of this tree. (*First Ann. Rep. Kansas Ex. Station*, 1888, 220.)

[2] A considerable number of fungi are parasitic upon Maples. As a rule, however, they are comparatively free from serious diseases caused by fungi, and the species found upon them, while possessing much botanical interest, cannot be said to be of great importance from the point of view of the arboriculturist. In Europe a disease caused by *Cercospora acerina*, R. Hartig, affects seedlings of the different species; it has not yet been observed, however, in this country, where the cultivation of Maples from seed is not very often attempted on a large scale. The most striking fungal disease of Maples in the United States is that caused by *Rhytisma acerinum*, Fr., which produces black and more or less circular and thickened spots of considerable size on the leaves. It is particularly conspicuous on the narrower lobes of the leaves of the Silver Maple, and is also common on the leaves of the Red and Sugar Maples. On those species which affect northern or mountainous regions, such as *A. Pennsylvanicum* and *A. spicatum*, a second form (*Rhytisma punctatum*, Fr.) is more frequently found. It differs in appearance from the first species in that the blotches are not a uniform black mass, but are aggregations of small black spots. The leaves affected with Rhytisma are conspicuous in the autumn, although the fungus does not mature until winter and after the leaves have fallen. *Rhytisma acerinum* is common in America, where it is found from Maine to Louisiana and California, as well as in Europe. Although less conspicuous to the eye, other leaf fungi are more injurious to Maples than the Rhytisma. In addition to the European species, *Glœosporium acerinum*, Westd., and *Phlœospora Aceris*, Sacc., occur on the Silver Maple in the United States, the last being common also on *Acer Negundo* in California. This is the American species first described by Berkeley and Curtis under the name of *Sphœropsis minima* (*Grevillea*, iii. 2), (*Phyllosticta acericola*, C. & E., *Phoma minima*, Sacc.), which attacks *A. barbatum*, *A. rubrum*, and *A. Pennsylvanicum* in the northern states, forming rather small scattered spots which are white, thin, and brittle with a black border. This fungus is occasionally so prevalent as to disfigure and injure the trees. In more mountainous districts, *A. Pennsylvanicum*, especially when young, is badly infested by *Septoria acerina* (25*th Ann. Rep. N. Y. State Museum*, 87), which forms brown irregularly polygonal spots on which are sprinkled the brownish fruit dots. When abundant and mature this fungus sometimes covers the leaves, and the copious spores exude in powdery whitish masses.

Of fungi belonging to the *Perisporiaceæ* or mildews, *Uncinula circinata*, C. & P., replacing the European *U. Aceris*, is common on nearly all the Maples of the northern states. This plant forms a thin white mesh with scattered minute black globules usually on the under side of the leaves. Of the species of fungi found on the trunks and branches of Maples, the greater portion belong to the *Pyrenomycetes* and *Hymenomycetes*. Most of these species, which are found also on other trees, are not known to produce any serious or widespread disease on Maples.

[3] *Inst.* 615, t. 386.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

ACER. Flowers polygamo-monœcious or polygamo-dicœcious; leaves simple.

Flowers usually polygamo-monœcious in terminal racemes on leafy branches, appearing later than the leaves.

Flowers in dense upright racemes.

Petals linear-spatulate, much longer than the sepals; leaves three or slightly five-lobed . 1. A. SPICATUM.

Flowers in drooping racemes.

Petals obovate; ovary and young fruit glabrous; leaves three-lobed at the apex . . . 2. A. PENNSYLVANICUM.

Petals obovate; ovary and young fruit hairy; leaves deeply five-lobed . . . . . 3. A. MACROPHYLLUM.

Flowers in terminal pedunculate corymbs, appearing with the leaves.

Flowers usually polygamo-monœcious; petals involute, much shorter than the sepals; leaves palmately seven to eight-lobed . . . . . 4. A. CIRCINATUM.

Flowers usually polygamo-dicœcious; petals linear, as long as the sepals; leaves three-lobed or three-parted . . . . . 5. A. GLABRUM.

Flowers usually polygamo-monœcious, in nearly sessile umbel-like terminal and lateral corymbs, appearing with the leaves.

Flowers apetalous; leaves three to five-lobed . . . . . 6. A. BARBATUM.

Flowers precocious, usually polygamo-dicœcious, in umbel-like fascicles from separate lateral buds.

Flowers sessile or short-pedunculate; ovary and young fruit tomentose; leaves deeply five-lobed . . . . . 7. A. SACCHARINUM.

Flowers long-pedunculate; ovary glabrous; leaves three to five-lobed . . . . . 8. A. RUBRUM.

NEGUNDO. Flowers dicœcious; leaves pinnately or ternately divided.

Flowers apetalous . . . . . 9. A. NEGUNDO.

ACER SPICATUM.

Mountain Maple.

Flowers in dense upright racemes; petals linear-spatulate, much longer than the sepals. Leaves 3 or slightly 5-lobed, tomentose on the lower surface.

Acer spicatum, Lamarck, *Dict.* ii. 381. — Persoon, *Syn.* i. 417. — De Candolle, *Prodr.* i. 593. — Don, *Gen. Syst.* i. 648. — Audubon, *Birds*, t. 134. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 163; *Hist. Veg.* iii. 87. — Torrey & Gray, *Fl. N. Am.* i. 246. — Dietrich, *Syn.* ii. 1281. — Torrey, *Fl. N. Y.* i. 135. — Chapman, *Fl.* 80. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 52. — Buchenau, *Bot. Zeit.* xix. 285, t. 11, f. 23. — Koch, *Dendr.* i. 522. — Emerson, *Trees Mass.* ed. 2, ii. 567, t. — Bell, *Rep. Geolog. Surv. Can.* 1879–80, 54c. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 46. — Pax, *Engler Bot. Jahrb.* vii. 188. — Watson & Coulter, *Gray's Man.* ed. 6, 117. — Wesmael, *Gen. Acer*, 16.

A. Pennsylvanicum, Du Roi, *Diss.* 61; *Harbk. Baum.* i. 22, t. 2 (not Linnæus). — Wangenheim, *Nordam. Holz.* 82, t. 12, f. 30. — Marshall, *Arbust. Am.* 2. — Castiglioni, *Viag. negli Stati Uniti*, ii. 172.

A. parviflorum, Ehrhart, *Beitr.* iv. 25; vi. 40. — Moench, *Meth.* 56.

A. montanum, Aiton, *Hort. Kew.* iii. 435. — Schmidt, *Oestr. Baum.* i. 13, t. 11. — Michaux, *Fl. Bor.-Am.* ii. 253. — Willdenow, *Spec.* iv. 988; *Enum.* 1045. — Desfontaines, *Hist. Arb.* i. 391. — *Nouveau Duhamel*, iv. 33. — Trattinick, *Archiv.* i. t. 13. — Pursh, *Fl. Am. Sept.* i. 267. — Nuttall, *Gen.* i. 253. — Guimpel, Otto & Hayne, *Abbild. Holz.* 59, t. 48. — Hayne, *Dendr. Fl.* 212. — Elliott, *Sk.* i. 452. — Sprengel, *Syst.* ii. 224. — Hooker, *Fl. Bor.-Am.* i. 111. — Bigelow, *Fl. Boston.* ed. 3, 408.

A small bushy tree, rising occasionally to a height of twenty-five or thirty feet, with a short trunk six or eight inches in diameter and slender upright branches; or more often a tall or low shrub. The bark of the trunk is very thin with a smooth or slightly furrowed reddish brown surface. The branchlets when they first appear are light gray and coated with pubescence which disappears during the summer; in the winter they become bright red, especially when exposed to the full action of the sun, and the following summer turn gray or pale brown again and are then somewhat blotched or streaked with green towards the base. The winter-buds are acute; the terminal flower-bud is an eighth of an inch long and more or less coated with pale tomentum, the leaf-buds being much smaller and glabrous or somewhat puberulous. The outer scales are red; the second pair are densely white-tomentose and deciduous; those of the inner ranks lengthen with the young shoots until at maturity they are an inch or more long, and are then lanceolate, pale and papery, and in falling leave narrow scars surrounding the base of the branchlets. The leaves are membranaceous, three or slightly five-lobed with taper-pointed lobes, and are conspicuously three-nerved with prominent veinlets; they are subcordate or sometimes nearly truncate at the base, sharply and coarsely glandular-serrate, and four or five inches in length by somewhat less in breadth, and are borne on slender petioles two or three inches long with enlarged bases. They are puberulous on the upper and densely tomentose on the lower surface when they unfold, and at maturity are hoary-pubescent below and glabrous above. The petiole is often scarlet in summer, while the blade of the leaf, which turns later to various shades of orange and scarlet, is still bright green. The minute greenish yellow flowers are produced together, the fertile towards the base, and the sterile at the ends of narrow many-flowered long-stemmed upright slightly compound pubescent racemes which appear during the month of June after the leaves are fully grown. The pedicels are thread-like and half to three quarters of an inch in length. The calyx-lobes are narrowly obovate, colored, pubescent on the outer surface, and much shorter than the linear-spatulate pointed petals. There are seven or eight stamens inserted immediately under the ovary, with slender glabrous filaments as long as the petals in the sterile flower and about the length of the sepals in the fertile flower, and glandular anthers. The ovary is densely coated with pale tomentum, and in the sterile flower is reduced

to a minute point surrounded by a tuft of pale hairs. The style is columnar and almost as long as the petals, with very short stigmatic lobes. The fruit is almost glabrous, with more or less divergent wings, and is rather more than an inch across. It is fully grown and bright red in July, turning brown late in the autumn, the racemes then being pendulous or nearly so. The seed is an eighth of an inch long, with a smooth dark testa and thick fleshy cotyledons.

Acer spicatum is common in all the region from the valley of the lower St. Lawrence River to northern Minnesota and the Saskatchewan, and extends southward through the northern states and along the Appalachian Mountains to northern Georgia. It is represented in the flora of eastern Asia by a plant widely distributed from Manchuria to Japan, hardly distinguishable from the American tree.[1]

Acer spicatum grows on moist rocky hillsides in the shade of other trees, and at the north is rarely more than a spreading shrub, becoming really a tree only on the western slopes of the high mountains of Tennessee and North Carolina, where it occurs in great abundance in forests of the Sugar Maple, the Beech, the Birch, the Hemlock, the Buckeye, and the Ash, often forming a considerable portion of the undergrowth.

The wood of *Acer spicatum* is light, soft, and close-grained, with thin inconspicuous medullary rays. It is light brown tinged with red, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.5330, a cubic foot weighing 33.22 pounds.

Acer spicatum, according to Aiton,[2] was cultivated in England as early as 1750 by Archibald, Duke of Argyll,[3] but it was not described by any botanist until twenty years later. It is now rarely cultivated, although well worth a place in the shrubbery.

[1] *A. spicatum*, var. *Ukurunduense*, Maximowicz, *Prim. Fl. Amur.* 65; *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 439 (Mél. Biol. x. 594). — Franchet & Savatier, *Enum. Pl. Jap.* i. 88. — Pax, *Engler Bot. Jahrb.* vii. 189. *A. Ukurunduense*, Middendorff, *Fl. Ochotsk.* No. 78.

[2] *Hort. Kew.* iii. 435.

[3] See i. 108.

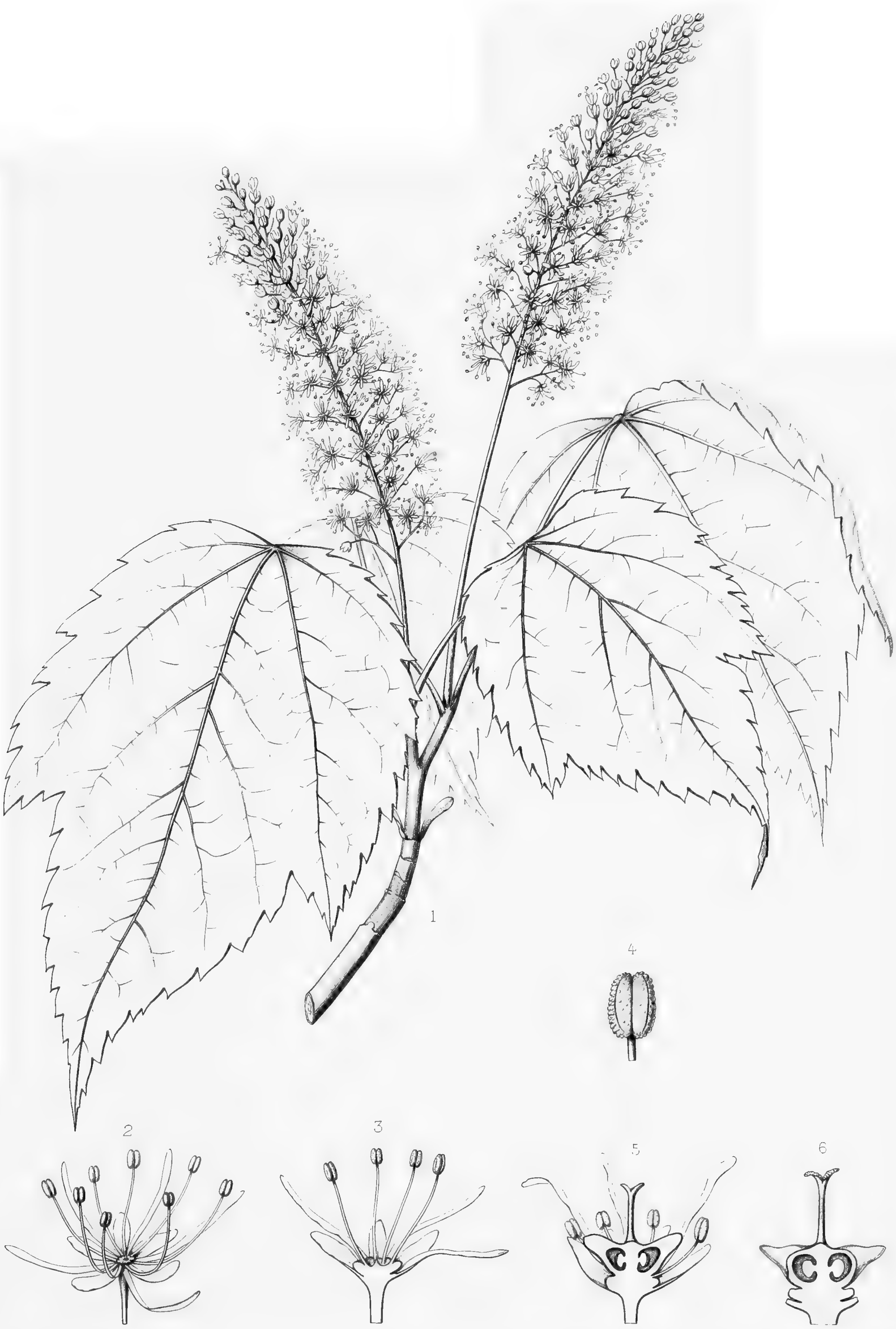
EXPLANATION OF THE PLATES.

Plate LXXXII. Acer spicatum.

1. A flowering branch, natural size.
2. A staminate flower, enlarged.
3. Vertical section of a staminate flower, enlarged.
4. An anther, front view, enlarged.
5. Vertical section of a pistillate flower, enlarged.
6. Vertical section of an ovary, enlarged.

Plate LXXXIII. Acer spicatum.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. A seed, enlarged.
4. An embryo, much magnified.
5. A winter branchlet, natural size.



C E. Faxon del. Picart fr. sc.

ACER SPICATUM, Lam

A. Riocreux direx.t Imp. R. Taneur, Paris.

C.E. Faucon del.

Picart fr. sc.

ACER SPICATUM, Lam

A Riocreux dirext.

Imp.b Turcat Paris.

ACER PENNSYLVANICUM.

Striped Maple. Moose Wood.

FLOWERS in long drooping racemes; petals obovate, as long as the sepals; ovary and young fruit glabrous. Leaves 3-lobed at the apex.

Acer Pennsylvanicum, Linnæus, *Spec.* 1055. — Michaux, *Fl. Bor.-Am.* ii. 252. — Willdenow, *Spec.* iv. 989; *Enum.* 1045. — Desfontaines, *Hist. Arb.* i. 391. — *Nouveau Duhamel*, iv. 32. — Trattinick, *Archiv.* i. t. 11. — Hayne, *Dendr. Fl.* 210. — Elliott, *Sk.* i. 451. — Torrey, *Fl. N. Y.* i. 135. — Sprengel, *Syst.* ii. 224. — Torrey & Gray, *Fl. N. Am.* i. 246. — Hooker, *Fl. Bor.-Am.* i. 111. — Gray, *Gen. Ill.* ii. 200, t. 174, f. 1–3. — Chapman, *Fl.* 80. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 52. — Buchenau, *Bot. Zeit.* xix. 285, t. 11, f. 24. — Koch, *Dendr.* i. 521. — Baillon, *Hist. Pl.* v. 373, f. 418–420. — Emerson, *Trees Mass.* ed. 2, ii. 566, t. — Bell, *Geolog. Rep. Canada*, 1879–80, 53c. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 46. — Pax, *Engler Bot. Jahrb.* vii. 245. — Watson & Coulter, *Gray's Man.* ed. 6, 117. — Wesmael, *Gen. Acer*, 46.

A. Canadense, Marshall, *Arbust. Am.* 3.

A. striatum, Du Roi, *Diss.* 58; *Harbk. Baum.* i. 8, t. 1. — Wangenheim, *Nordam. Holz.* 29, t. 12, f. 28. — Castiglioni, *Viag. negli Stati Uniti*, ii. 172. — Lamarck, *Dict.* ii. 381. — Ehrhart, *Beitr.* iv. 25. — Schmidt, *Oestr. Baum.* i. 13, t. 10. — Moench, *Meth.* 56. — Persoon, *Syn.* i. 417. — Michaux f. *Hist. Arb. Am.* ii. 242, t. 17. — Pursh, *Fl. Am. Sept.* i. 267. — Nuttall, *Gen.* i. 253. — De Candolle, *Prodr.* i. 593. — Watson, *Dendr. Brit.* ii. t. 170. — Don, *Gen. Syst.* i. 648. — Loudon, *Arb. Brit.* i. 407, t. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 162; *Hist. Veg.* iii. 85. — Dietrich, *Syn.* ii. 1281. — Bigelow, *Fl. Boston.* ed. 3, 407.

A small tree, thirty or forty feet in height, with a short trunk eight or ten inches in diameter and slender upright branches; or often much smaller and shrubby in habit. The bark of the trunk varies from an eighth to a quarter of an inch in thickness and is reddish brown, marked longitudinally with broad pale stripes, and roughened with numerous horizontal oblong excrescences. The branchlets are pale greenish yellow, very smooth, and at first change little in appearance except to turn bright reddish brown during the winter when they are exposed to the action of the sun; but at the end of two or three years become striped like the trunk, with broad pale marks. The terminal winter-bud is conspicuously stipitate, and when it contains an inflorescence is almost half an inch long and much longer than the axillary buds; it is covered by two thick bright red spatulate boat-shaped scales prominently keeled on the back and inclosing a second pair of scales densely coated with white tomentum; the inner scales are green and foliaceous, and enlarge with the young shoots until they are an inch and a half or two inches long and half an inch wide when they are pubescent and bright yellow or rose-colored; in falling they leave two or sometimes three conspicuous narrow scars surrounding the base of the branches. The leaves are palmately three-nerved, three-lobed at the apex, rounded or cordate at the base, and finely and sharply doubly serrate, the short lobes contracted into tapering serrate points; they are five or six inches long and four or five inches broad, and are borne on stout grooved petioles an inch and a half to two inches in length, the enlarged bases of each pair nearly uniting and embracing the branch. The leaves, when they first appear, are thin and membranaceous, pale rose-colored, and coated with ferrugineous pubescence, especially on the lower surface and petiole. This gradually disappears, and at maturity the leaves are glabrous with the exception of a tuft of ferrugineous hairs in the axils of the principal nerves on the upper surface, membranaceous, pale green above and rather paler below. In the autumn they turn a clear bright yellow. The flowers unfold towards the end of May or in early June when the leaves are nearly fully grown; they are borne in slender drooping long-stemmed racemes from four to six inches in length, the sterile and fertile flowers being usually produced on different racemes on the same plant. The pedicels are thread-like, and vary from a quarter to half an inch

in length. The sepals are petaloid, linear-lanceolate or obovate, a quarter of an inch long and a little shorter and narrower than the bright canary-yellow petals. There are seven or eight stamens, which are shorter than the petals in the sterile flower, and rudimentary in the fertile flower. The pistil is purplish brown and puberulous, with a stout style united nearly to the top and spreading recurved stigmas; in the sterile flower it is reduced to a minute pointed rudiment. The fruit, which is produced in long drooping racemes, is glabrous with thin spreading wings three quarters of an inch long, and is marked on one side of each nutlet by a small cavity. The seed is a quarter of an inch long with a dark red-brown slightly rugose coat.

The northern limits of *Acer Pennsylvanicum* are the shores of Ha-Ha Bay in the valley of the Saguenay River; it ranges westward along the shores of Lake Ontario and the islands of Lake Huron to northeastern Minnesota; it is common in the northern Atlantic states, especially in the interior and elevated regions, and extends southward along the Appalachian Mountains to northern Georgia.[1]

Acer Pennsylvanicum is a shade-loving plant, and usually grows in forests composed of the Sugar Maple, the Beech, the Canoe Birch, the Yellow Birch, and the Hemlock, often forming in some parts of northern New England a large proportion of their shrubby undergrowth. In more open situations it rises in the northern states to the height of a small tree, but attains its greatest size on the slopes of the Big Smoky Mountains in Tennessee and of the Blue Ridge in North and South Carolina.

The wood of *Acer Pennsylvanicum* is light, soft, and close-grained; it contains numerous thin medullary rays, and is light brown with thick lighter colored sapwood consisting of thirty to forty layers of annual growth. The specific gravity of the absolutely dry wood is 0.5299, a cubic foot weighing 33.02 pounds.

Acer Pennsylvanicum has few economic uses. In some parts of the country cattle are turned into the forest in the early spring to browse on the young and tender shoots filled with saccharine juice, which are the favorite food of the moose and the deer. Its principal value, however, consists in its beauty. The excellent habit of this small tree, the brilliancy of its young leaves and bud-scales in early spring, its handsome graceful flowers, its large bright summer foliage and brilliant autumn colors, and the conspicuous markings of its trunk and branches, more striking in winter even than in summer, make it a valuable garden plant, beautiful at all seasons of the year.

Acer Pennsylvanicum appears to have been first noticed in 1747 by the Swedish traveler Kalm,[2] who sent it to Linnæus.[3] It was introduced in 1755[4] into the gardens of Europe, where it is still occasionally cultivated.

[1] The type represented in America by *Acer Pennsylvanicum* appears in the flora of Japan in *A. rufinerve* (Siebold & Zuccarini, *Abhand. Akad. Münch.* iv. 2, 155; *Fl. Jap.* ii. 85, t. 148. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 441 [Mél. Biol. x. 596]), which is barely distinguishable from the American plant except in some comparatively unimportant characters.

[2] Peter Kalm (1715–1779) was a native of Bothnia and a favorite pupil and disciple of Linnæus, at whose instance he was sent by the Swedish government to travel in America, where he landed in 1748 and remained during three years, devoting them to explorations of the flora and natural resources of the middle and northern states. On his return to Sweden Kalm was appointed professor of botany in the University at Åbo, and published (1753–1761) an account of his American travels. A German edition of this interesting book soon appeared, and was followed in 1772 by an English edition. This is the most important of Kalm's published works, although he wrote a number of botanical treatises. His memory is perpetuated by the name of the beautiful Mountain Laurel, *Kalmia*, bestowed by his master, Linnæus.

[3] The earliest figure of *Acer Pennsylvanicum* was published by Duhamel in the *Traité des Arbres* in 1755 (i. 28, t. 12).

[4] Aiton, *Hort. Kew.* iii. 435.

EXPLANATION OF THE PLATES.

Plate LXXXIV. Acer Pennsylvanicum.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. Diagram of a flower.
4. Vertical section of a staminate flower, enlarged.
5. An anther, front and back views, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A winter branchlet, natural size.

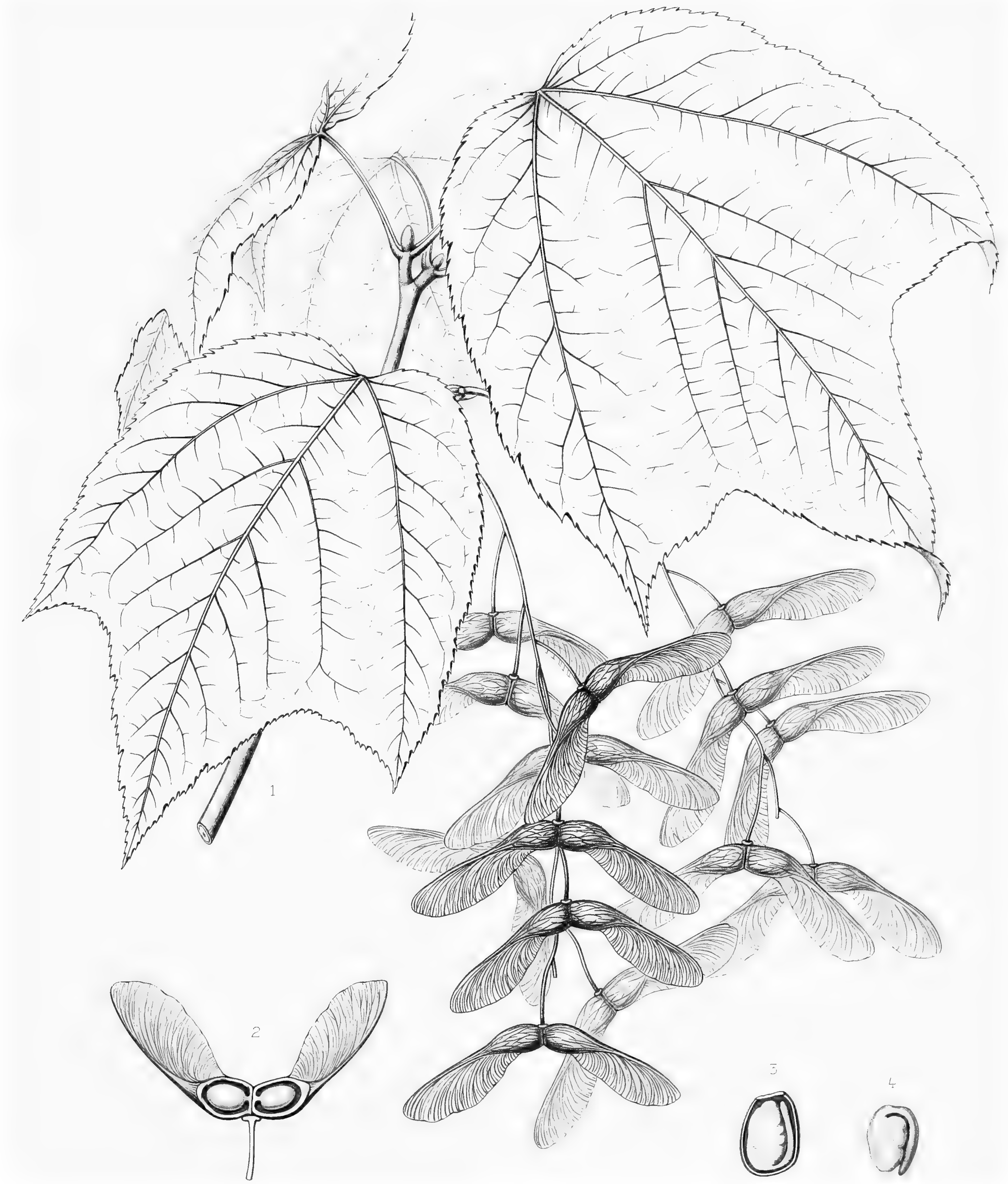
Plate LXXXV. Acer Pennsylvanicum.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, natural size.
3. Vertical section of a seed, enlarged.
4. An embryo, enlarged.

C. E. Faxon del. Picart fr. sc

ACER PENNSYLVANICUM, L.

A. Riocreux direx.t Imp.h. Taneur, Paris.



C.E. Faxon del.

Picart fr. sc

ACER PENNSYLVANICUM. L.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

ACER MACROPHYLLUM.

Broad Leaved Maple.

FLOWERS in long drooping racemes; ovary and young fruit hairy. Leaves deeply 5-lobed.

Acer macrophyllum, Pursh, *Fl. Am. Sept.* i. 267. — Poiret, *Lam. Dict.* Suppl. v. 669. — Nuttall, *Gen.* i. 253; *Sylva*, ii. 77, t. 67. — De Candolle, *Prodr.* i. 594. — Sprengel, *Syst.* ii. 225. — Hooker, *Fl. Bor.-Am.* i. 112, t. 38. — Don, *Gen. Syst.* i. 648. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 165. — Torrey & Gray, *Fl. N. Am.* i. 246. — Hooker & Arnott, *Bot. Voy. Beechey*, 327. — Dietrich, *Syn.* ii. 1281. — Bentham, *Pl. Hartweg.* 301. — Torrey, *Pacific R. R. Rep.* iv. 74; *Bot. Mex. Bound. Surv.* 47; *Bot. Wilkes Explor. Exped.* 258. — Newberry, *Pacific R. R. Rep.* vi. 21, 69. — Cooper, *Pacific R. R. Rep.* xii. 28, 57. — Lyall, *Jour. Linn. Soc.* vii. 134, 144. — Bolander, *Proc. Cal. Acad.* iii. 78. — Rothrock, *Smithsonian Rep.* 1867, 334. — Koch, *Dendr.* i. 528. — Gray, *Proc. Am. Acad.* viii. 379. — Brewer & Watson, *Bot. Cal.* i. 107. — G. M. Dawson, *Canadian Nat.* n. ser. ix. 330. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 47. — Pax, *Engler Bot. Jahrb.* vii. 190. — Wesmael, *Gen. Acer*, 17.

A. palmatum, Rafinesque, *New Fl.* i. 48 (not Thunberg).

A tree, eighty to a hundred feet high, with a tall straight trunk two or three feet in diameter and stout often pendulous branches forming a compact handsome head. The bark of the trunk is from a half to three quarters of an inch thick; it is brown faintly tinged with red or bright reddish brown, deeply furrowed and broken on the surface into small square plate-like scales. The branchlets are at first smooth and pale green; during the first winter they become bright green or dark red, and are covered more or less thickly with small longitudinal white spots, and encircled at the base with the scars of the accrescent inner bud-scales; during the second summer they turn gray or grayish brown. The obtuse terminal winter-buds are a quarter of an inch long, and are surrounded by two pairs of short broad slightly spreading dark red scales rounded on the back, ciliate on the margins, and contracted at the apex into short blunt points; the next pair of scales are also colored, with united edges, and are rounded at the apex. The remainder are green and foliaceous, and when fully grown are an inch and a half long, and are then colored, puberulous, and tipped with short blunt points. The axillary buds are minute, obtuse, and are not provided with the spreading outer scales of the terminal bud. The leaves are puberulous when they first unfold, especially on the upper surface along the principal veins; they are prominently three to five-nerved, deeply three to five-cleft, with sinuate acuminate divisions furnished with two or three acute lobes, and cordate at the base by a deep narrow sinus. They are rather coriaceous at maturity, dark green and lustrous on the upper, and pale on the lower surface, eight to twelve inches in diameter, and are borne on stout petioles ten or twelve inches long with enlarged bases which unite and encircle the stem and are often supplied on the inside with a small tuft of white hairs. In Oregon the leaves turn in the autumn to a bright orange-color before falling. The staminate and pistillate flowers are produced together in graceful pendulous slightly puberulous racemes four to six inches in length, which appear in April and May after the leaves are fully grown; they are bright yellow, fragrant, a quarter of an inch long, and borne on slender pubescent and often branched pedicels a half to three quarters of an inch in length. The sepals are petaloid, obovate, obtuse, and a little longer and broader than the spatulate petals. There are nine or ten stamens with orange-colored anthers and long slender filaments, hairy at the base, exserted in the sterile, and included in the fertile flower. The ovary is coated with pale tomentum, and in the staminate flower is reduced to a minute rudiment; the styles are united at the base only; and the stigmas are long and exserted. The fruit, which is fully grown by the first of July, is then pale green, and ripens late in the autumn; the nutlets

are covered with long pale hairs, and the wings are an inch and a half in length, half an inch in breadth, slightly divergent, and glabrous with the exception of a few hairs on the thickened edge. The seed is a quarter of an inch long, with a dark claret-colored rugose pitted coat and foliaceous cotyledons.

Acer macrophyllum inhabits the coast of Alaska south of latiude 55° north; it occurs on the islands and coast of British Columbia, is widely and generally distributed through Washington and Oregon west of the Cascade Mountains, and spreads south along the coast ranges and the western slope of the Sierra Nevada of California to the San Bernardino Mountains and to Hot Spring valley, San Diego County, rarely extending more than four thousand feet above the level of the sea. It grows along the banks of streams or on rich bottom-lands, or sometimes in California on the rocky slopes of mountain valleys, reaching its greatest size in the humid climate and rich soil of the bottom-lands of southern Oregon, where, with the Laurel and the Alder, it abounds in extensive and beautiful forests, sending up tall stout stems clothed with moss. In California it is usually much smaller, especially in the coast ranges, often occurring as an isolated specimen, when it forms a low wide-branched round-headed tree.

The wood of *Acer macrophyllum* is light, soft, and not very strong; it is close-grained, and can be easily worked and given a beautiful polish. It is rich brown tinged with red, with thick lighter colored or often nearly white sapwood composed of sixty or eighty layers of annual growth, and many thin medullary rays. The specific gravity of the absolutely dry wood is 0.4909, a cubic foot weighing 30.59 pounds. The grain is often beautifully curled and contorted, and sometimes forms concentric rings similar to those found in the wood of the Sugar Maple. It is the most valuable wood produced by any deciduous tree of the forests of western North America, and in Washington and Oregon is largely used for the interior finish of buildings, for furniture, and for axe and broom handles.[1]

Acer macrophyllum was discovered on the northwest coast late in the last century by Archibald Menzies,[2] and a few years later was observed near the cascades of the Columbia River by the members of the first transcontinental exploring expedition under Lewis and Clark. It is said to have been introduced into England in 1812.[3] *Acer macrophyllum* flourishes in the temperate parts of Europe, where it has long flowered and ripened its fruit, and where it forms a low round-headed tree remarkable for the size and beauty of its leaves, which are larger than those of any other Maple. In eastern America, where it is very rarely cultivated, it is hardy as far north as eastern Pennsylvania at least, and may be expected in sheltered situations to withstand the climate of southern New England.

[1] Sugar of good quality has, according to Greene (*Fl. Francis.* i. 76), been made in the mountains of California from *Acer macrophyllum;* and the young twigs when cut exude a milky juice.

[2] Archibald Menzies (1754–1842) was born at Weem in the county of Perth, Scotland, and was early attached to the Botanic Garden of Edinburgh, of which his brother William was afterwards curator. Through the assistance of Dr. Hope, the professor of botany in the University, he was enabled to obtain the degree of M. D. He then settled at Caernarvon, but soon entered the navy as assistant-surgeon on board the Nonsuch, and was present at the victory obtained by Rodney over the Comte de Grasse in April, 1782. In 1786 he joined as surgeon a vessel sent by a commercial firm on a voyage of discovery to the northwest coast of America. During this voyage Menzies visited Staten Island, where he appears to have remained for some time, the Sandwich Islands and China, and the northwest coast of America, returning to England in 1789. Menzies was appointed the following year naturalist to Captain Vancouver, whom he accompanied on his celebrated voyage of discovery, during which he visited King George's Sound on the coast of New Holland, New Zealand, the Sandwich Islands, and the northwest coast of America, returning to England in 1795. Subsequently he served in the West Indies as a naval surgeon, but early in the century quitted the sea and established himself as a physician in London. Menzies made large collections of natural objects, especially in botany, and first introduced into Europe the Chilian Araucaria. *Menziesia*, a genus of delicate shrubs belonging to the Heath family and represented by several species of North America and of eastern and northeastern Asia, commemorates his name.

[3] Loudon, *Arb. Brit.* i. 408, f. 117, 118, t. 28.

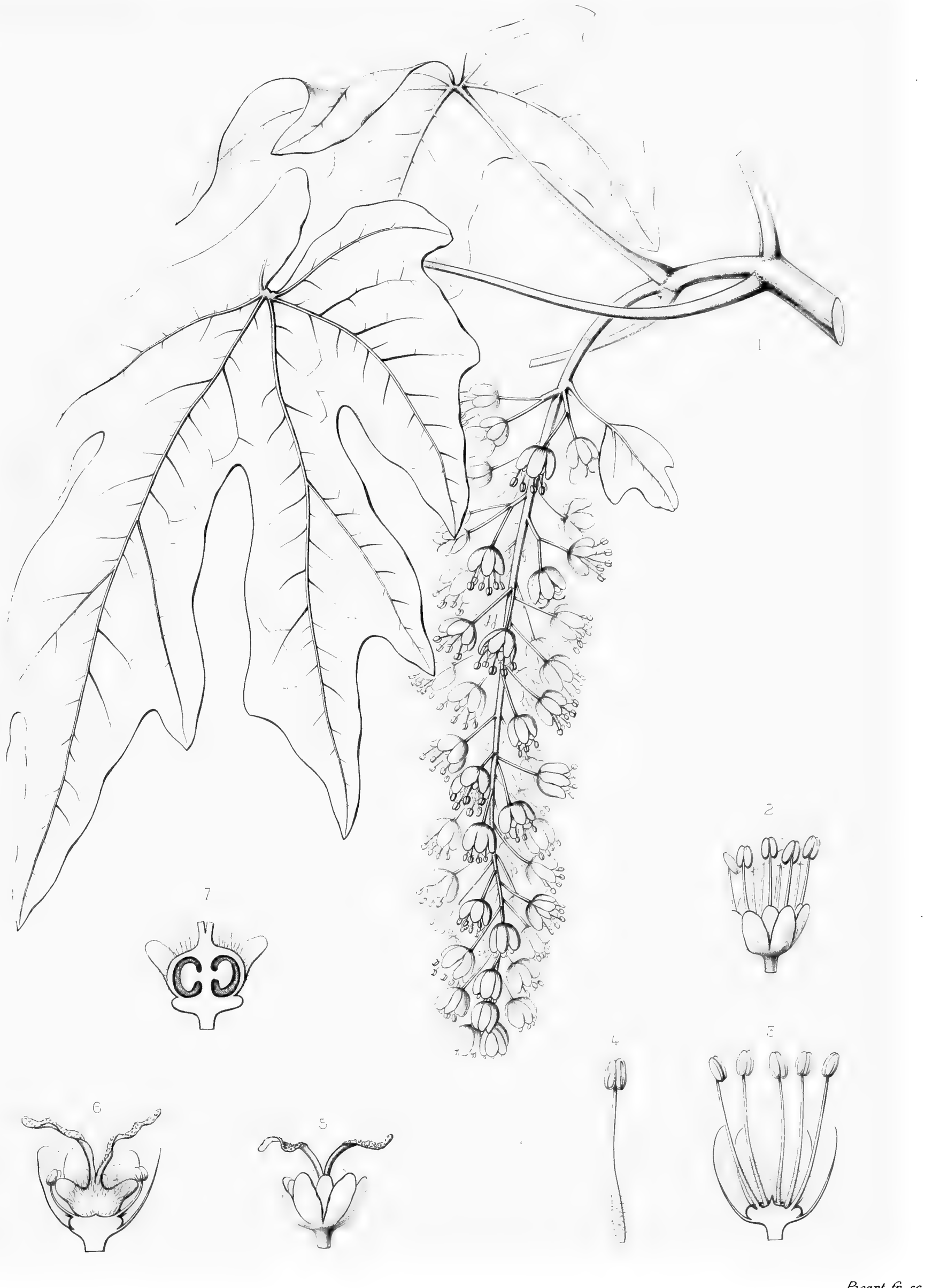
EXPLANATION OF THE PLATES.

Plate LXXXVI. Acer macrophyllum.

1. A flowering branch, natural size.
2. A staminate flower, enlarged.
3. Vertical section of a staminate flower, enlarged.
4. A stamen, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. Vertical section of an ovary, enlarged.

Plate LXXXVII. Acer macrophyllum.

1. A fruiting branch, natural size.
2. Vertical section of a samara, natural size.
3. An embryo, much magnified.
4. An embryo displayed, much magnified.
5. A winter branchlet, natural size.



C E Faxon del

Picart fr. sc.

ACER MACROPHYLLUM, Pursh.

A. Riocreux direx.t

Imp R. Taneur, Paris.

C. E. Faxon del.

Pourt fr sc.

ACER MACROPHYLLUM, Pursh.

A. Riocreux dirext

Imp R. Taneur Paris.

ACER CIRCINATUM.

Vine Maple.

FLOWERS in terminal umbel-like corymbs; petals involute, much shorter than the sepals. Leaves palmately 7 to 9-lobed.

Acer circinatum, Pursh, *Fl. Am. Sept.* i. 266. — Poiret, *Lam. Dict.* Suppl. v. 669. — Nuttall, *Gen.* i. 253; *Jour. Phil. Acad.* vii. 17 (excl. syn.); *Sylva*, ii. 80, t. 67. — De Candolle, *Prodr.* i. 595. — Sprengel, *Syst.* ii. 225. — Don, *Gen. Syst.* i. 651. — Loudon, *Arb. Brit.* i. 422, f. 112. — Spach, *Ann. Sci. Nat.* ser. 2, ii. 169; *Hist. Veg.* iii. 97. — Torrey & Gray, *Fl. N. Am.* i. 247. — Hooker, *Fl. Bor.-Am.* i. 112, t. 39. — Dietrich, *Syn.* ii. 1282. — Lindley, *Paxton Fl. Gard.* ii. 156, f. 210; *Gard. Chron.* 1851, 791, f. 210. — Newberry, *Pacific R. R. Rep.* vi. 21, 69. — Cooper, *Pacific R. R. Rep.* xii. 28, 57. — Lyall, *Jour. Linn. Soc.* vii. 134. — Gray, *Proc. Am. Acad.* viii. 379. — Koch, *Dendr.* i. 523. — Torrey, *Bot. Wilkes Explor. Exped.* 258. — Brewer & Watson, *Bot. Cal.* i. 107. — G. M. Dawson, *Canadian Nat.* n. ser. ix. 330. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 47. — Pax, *Engler Bot. Jahrb.* vii. 203. — Wesmael, *Gen. Acer*, 25.

A. virgatum, Rafinesque, *New Fl.* i. 48.

A low tree, rarely thirty or forty feet in height, often vine-like or prostrate, with a trunk ten or twelve inches in diameter covered with thin smooth bright red-brown bark marked by numerous shallow fissures; or often a low wide-spreading shrub. The branchlets are glabrous, sometimes pale green and sometimes reddish brown, frequently covered late in the season and during their first winter with a glaucous bloom, and occasionally marked with small lenticular spots. The winter-buds are an eighth of an inch long, rather obtuse, and furnished at the base with a short brown papery subpetiolar scale with ciliate margins. The outer bud-scales are rounded on the back, rather thin, and bright red; they inclose a pair of thick scales coated with dense white tomentum which protect the inner series; these are green in the bud and lengthen with the growing shoot until at maturity they are two inches long, a quarter of an inch broad, obovate-spatulate, rounded at the apex, contracted into a long narrow claw, bright rose-colored, and more or less hairy-pubescent, especially on the outer surface. The leaves are almost round in outline, palmately seven to nine-lobed sometimes nearly to the middle, with acute lobes sharply and irregularly doubly-serrate; they are conspicuously palmately-nerved with prominent veinlets, and are cordate at the base by a broad shallow sinus, or sometimes almost truncate, two to seven inches across, and borne on stout grooved petioles one or two inches long which clasp the stem by their large bases; they are tinged with rose-color when they unfold and are then somewhat puberulous, principally on the lower surface and the petioles, but at maturity are glabrous with the exception of a tuft of pale hairs in the axils of the large veins on the upper surface; they are thin and membranaceous, dark green above and paler below, and in the autumn turn orange and scarlet. The flowers appear when the leaves are about half grown in loose ten to twenty-flowered umbel-like corymbs drooping on long stems from the ends of slender two-leaved branchlets, the staminate and pistillate flowers being produced together. The sepals are oblong or obovate, acute, villous, purple or red, and much longer than the greenish white broadly cordate acute petals which are folded together at the apex. There are from six to eight stamens with slender filaments villous at the base, exserted in the sterile flower, and in the fertile flower shorter than the petals. The ovary is glabrous with spreading lobes, and is surmounted by a style divided near the base into long exserted stigmas; in the staminate flower it is reduced to a small point surrounded by a tuft of pale hairs. The fruit is two or three inches long with thin wings which spread almost at right angles to the peduncle and, like the nutlets, are red or rose-colored in early summer, when the fruit is fully grown, although it does not ripen until late in the autumn. The seed is ovate, with a pale chestnut-brown testa and foliaceous cotyledons.

Acer circinatum inhabits the coast of British Columbia, and extends southward through Washington and Oregon to Mendocino County in California. In Washington and Oregon it is one of the most common of the deciduous-leaved trees, lining the banks of streams up to an elevation of four thousand feet above the sea-level, and reaching its greatest size on the low alluvial soil of bottom-lands. In such situations the vine-like stems spring four or five together from the ground, spreading in wide curves and sending out long slender branches which root when they touch the ground and form impenetrable thickets of contorted and interlaced trunks, often many acres in extent and so dense that no other plant can grow beneath their shade. In California the Vine Maple is smaller and much less common, growing along streams in the coniferous forests.

The wood of *Acer circinatum* is hard, heavy, close-grained, and not very strong; it is light brown or sometimes nearly white, with thick lighter colored sapwood and many thin medullary rays. The specific gravity of the absolutely dry wood is 0.6660, a cubic foot weighing 41.51 pounds. It is used for fuel, for the handles of axes and other tools, and by the Indians of the northwest coast for the bows of their fishing nets.

Acer circinatum was discovered in 1806 near the cascades of the Columbia River by the members of the transcontinental exploring expedition under command of Lewis and Clark. It was introduced into cultivation in 1827 through the Horticultural Society of London, which received seeds from David Douglas.[1] In New England it has proved the hardiest of the trees from the Pacific coast, forming a low round-headed tree with a short stout trunk and long branches that sweep the ground, flowering and ripening its seed every year, and here unsurpassed in beauty of form, foliage, and flower by any of the smaller trees of the genus which are known in cultivation.

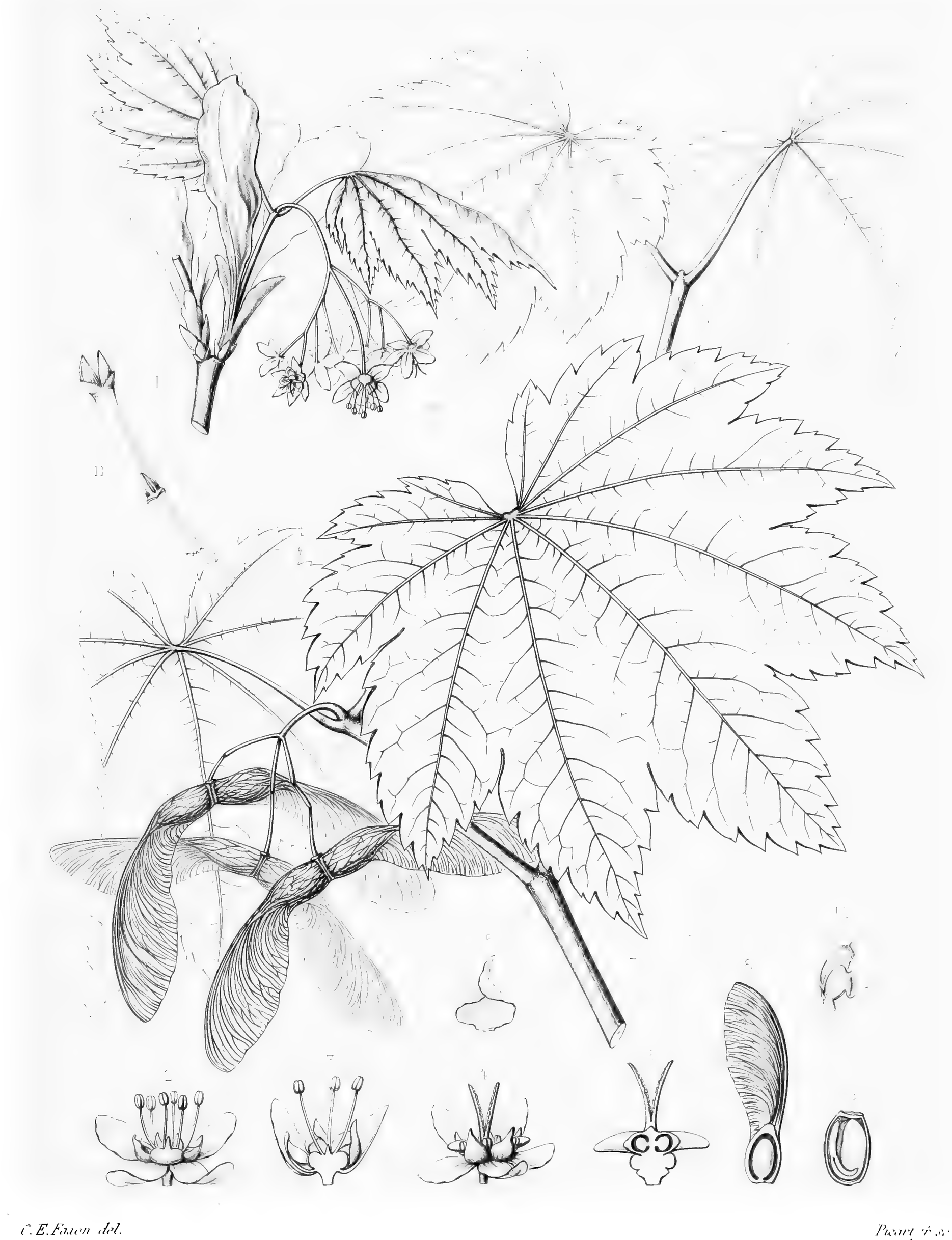
[1] David Douglas (1798–1834); a Scotch gardener sent by the Horticultural Society of London to explore the forests of the Northwest Territory, is, from his courage, energy, and success in the presence of great difficulties and dangers, and from his untimely and horrible death, a conspicuous figure in the annals of American botanical exploration. Douglas, who had been trained by Sir William Hooker and had made a short botanical journey in eastern America in 1823, was sent in 1824 by the way of Cape Horn to the Columbia River, where he arrived in April, 1825. He spent two years in Oregon, discovering some important trees, including *Abies nobilis*, *Abies amabilis*, and *Pinus Lambertiana*, the largest of its race. In March, 1827, Douglas started from Fort Vancouver on the Columbia, crossed the continent by the Hudson's Bay posts, and embarked for England, which he reached in October of the same year. Two years later he left England for the last time and reached the mouth of the Columbia on the 3d of June, 1830, remaining in Oregon until the autumn, when he sailed for Monterey. Here he remained until the next summer, discovering no less than a hundred and fifty species of undescribed plants, and then sailed for the Sandwich Islands. In the autumn of this year he returned to the Columbia River, and in the following summer extended his exploration as far north as the Fraser River, in which he was wrecked, losing his collections and instruments and barely escaping with his life. But the beauties of tropical vegetation lured him from the awful solitude of the sombre Fir forests of the northwest, and in October, 1833, he sailed again for the Sandwich Islands. Here he passed the winter, and on the 12th of July, 1834, while engaged in exploring the high peaks of the islands, he fell into a pit in which a wild bull had been captured, and several hours later was found dead and terribly mangled.

Douglas is said to have introduced two hundred and seventeen species of plants into English gardens, the list including many valuable and beautiful trees like the Redwood, the Sugar Pine, and the Douglas Fir. No other collector has ever reaped such a harvest in America, or associated his name with so many useful plants. By an unfortunate hazard of fate the noble Douglas Fir, the most important timber-tree introduced by Douglas, and one of the most valuable trees in the world, does not, as might well have been the case, perpetuate his name in the language of science, and it is a humble primrose-like alpine herb which commemorates this explorer of forests and discoverer of mighty trees.

EXPLANATION OF THE PLATE.

PLATE LXXXVIII. ACER CIRCINATUM.

1. A flowering branch, natural size.
2. A staminate flower, enlarged.
3. Vertical section of a staminate flower, enlarged.
4. A pistillate flower, enlarged.
5. A petal, enlarged.
6. Vertical section of an ovary, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a samara, natural size.
9. Vertical section of a seed, enlarged.
10. An embryo displayed and much magnified.
11. Winter-buds, natural size.



C. E. Faucon del. Picart frères

ACER CIRCINATUM, Pursh.

A Riocreux direct^r Imp. R. Lasnier Paris

ACER GLABRUM.

Dwarf Maple.

FLOWERS in terminal racemose corymbs; petals linear, as long as the sepals. Leaves 3-lobed or 3-parted.

Acer glabrum, Torrey, *Ann. Lyc. N. Y.* ii. 172; *Bot. Wilkes Explor. Exped.* 259. — Don, *Gen. Syst.* i. 650. — Torrey & Gray, *Fl. N. Am.* i. 247, 684. — Walpers, *Rep.* i. 409. — Nuttall, *Sylva*, ii. 86. — Newberry, *Pacific R. R. Rep.* vi. 69. — Cooper, *Smithsonian Rep.* 1858, 258; *Pacific R. R. Rep.* xii. 51, 57; *Am. Nat.* iii. 406. — Gray, *Am. Jour. Sci.* ser. 2, xxxiv. 259; *Proc. Phil. Acad.* 1863, 59. — Watson, *King's Rep.* v. 52. — Brewer & Watson, *Bot. Cal.* i. 107. — Rothrock, *Wheeler's Rep.* vi. 83. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 47. — Coulter, *Man. Rocky Mt. Bot.* 49. — Pax, *Engler Bot. Jahrb.* vii. 218. — Wesmael, *Gen. Acer*, 30. — Greene, *Fl. Francis.* i. 76.

A. Douglasii, Hooker, *London Jour. Bot.* vi. 77, t. 6. — Pax, *Engler Bot. Jahrb.* vii. 219. — Wesmael, *Gen. Acer*, 30.

A. tripartitum, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 247. — Dietrich, *Syn.* ii. 1281. — Walpers, *Rep.* i. 409. — Nuttall, *Sylva*, ii. 85, t. 71. — Gray, *Pl. Fendler.* 28 (*Mem. Am. Acad.* n. ser. iv.); *Pacific R. R. Rep.* iv. 73. — Newberry, *Pacific R. R. Rep.* vi. 69.

A. glabrum, var. **tripartitum**, Pax, *Engler Bot. Jahrb.* vii. 218.

A low bushy tree, rarely twenty or twenty-five feet in height, with a short trunk six or eight inches in diameter covered with smooth reddish brown bark, and slender upright branches; or more often a shrub four or five feet high. The branchlets are at first pale grayish brown, often slightly many-angled on vigorous shoots, and quite glabrous; they become bright red-brown during the first winter, and are then conspicuously marked at the base by the scars left by the falling of the accrescent inner bud-scales. The winter-buds are acute, an eighth of an inch long, and covered with vivid red or occasionally yellow scales; the second pair of scales are bright rosy red, and more or less hairy-pubescent, especially within, while those of the inner ranks are pale brown tinged with pink, and at maturity are sometimes an inch and a half long, narrowly spatulate, very thin, and tomentose on the inner surface. The leaves are glabrous, membranaceous, rounded in outline, cordate-truncate or wedge-shaped at the base, and three to five-lobed, or often three-parted or three-foliolate, with acute or obtuse, doubly serrate lobes; they are from an inch to five inches across, rather conspicuously veined, dark green and lustrous on the upper, and paler on the lower surface, and are borne on stout grooved petioles which vary in length from one to six inches, and are often bright red.[1] The staminate and pistillate flowers are usually produced separately on different plants in loose few-flowered glabrous racemose corymbs borne on slender drooping peduncles from the ends of two-leaved branchlets. The sepals are oblong, obtuse, petaloid, and as long as the greenish yellow petals. There are seven or eight stamens with glabrous unequal filaments, which in the sterile flower are shorter than the petals, and much shorter or rudimentary in the fertile flower. The ovary, which is rudimentary or wanting in the sterile flower, is glabrous, with short obtuse lobes, and is surmounted with a style that divides at the base into two spreading stigmatic lobes the length of the petals. The fruit is glabrous, and an inch or rather less in length, with broad nearly erect or slightly spreading wings which are often rose-colored during the summer. The seeds are ovate, with a bright chestnut-brown testa and thin foliaceous cotyledons.

Acer glabrum is widely distributed from British Columbia over the mountain ranges of western America, extending south in California along the Sierra Nevada Mountains to the Yosemite valley, and reaching the eastern slope of the Rocky Mountains of Colorado and the mountains of eastern New Mexico and western Arizona. It is found on the borders of mountain streams, usually at an elevation

[1] It is not unusual to find lobed and trifoliate leaves on the same branches.

of five or six thousand feet, although at the north it sometimes descends to within a few hundred feet of the sea-level. It is rarely more than a low shrub, and only in some of the elevated cañons of New Mexico, Arizona, and Idaho assumes the habit of a tree.

The wood of *Acer glabrum* is heavy, hard, and close-grained; it is light brown or often nearly white, with thick lighter colored sapwood and numerous medullary rays. The specific gravity of the absolutely dry wood is 0.6028, a cubic foot weighing 37.57 pounds.

Acer glabrum was discovered in the valley of the Bear River by Dr. James,[1] the naturalist of the United States Exploring Expedition which reached the Rocky Mountains in 1820 under command of Major Stephen H. Long. It was introduced several years ago into the Botanic Garden of Harvard College, where, as in the Arnold Arboretum, it is perfectly hardy, forming a small shrub which flowers and fruits every year.

[1] Edwin James (1797–1861), best known as the botanist and historian of Long's Rocky Mountain Expedition, was born in Weybridge, Vermont, and educated at the Middlebury Academy in that state, afterwards studying medicine in Albany, New York, where, under the inspiration of Eaton, he became interested in natural science. In 1820 Dr. James, having been appointed a surgeon in the United States army, was attached as naturalist to the party sent to explore the then little known central part of the continent, and made many interesting discoveries on the alpine heights of the central Rocky Mountains, which he was the first botanist to reach. Dr. James remained in the army until 1830, and then returned to Albany where he engaged in editorial duties, and in 1836 removed to Burlington, Iowa, then on the very edge of the wilderness. Extreme views on moral and religious subjects separated him from the world, and he passed the last years of his life, brought to an end by an unfortunate accident, as a recluse. *Jamesia*, a delicate shrub of the Saxifrage family, represented by the single species discovered by Dr. James in the Rocky Mountains, perpetuates his name. (See *Am. Jour. Sci.* ser. 2, xxxiii. 428.)

EXPLANATION OF THE PLATE.

PLATE LXXXIX. ACER GLABRUM.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. Vertical section of a staminate flower, enlarged.
4. Vertical section of a pistillate flower, enlarged.
5, 6. Fruiting branches, natural size.
7. Vertical section of a fruit, enlarged.
8. Vertical section of a seed, enlarged.
9. An embryo, much magnified.
10. A three-parted leaf, natural size.
11. A winter branchlet, natural size.

C.E. Faxon del.

J. Ward fr sc.

ACER GLABRUM. Torr.

A. Riocreux direx.t

Imp R. Taneur, Paris.

ACER BARBATUM.

Sugar Maple. Rock Maple.

FLOWERS in nearly sessile umbel-like corymbs, apetalous. Leaves 3 to 5-lobed.

Acer barbatum, Michaux, *Fl. Bor.-Am.* ii. 252. — Willdenow, *Spec.* iv. 989. — Poiret, *Lam. Dict.* Suppl. ii. 575. — Pursh, *Fl. Am. Sept.* i. 266. — Nuttall, *Gen.* i. 253. — Elliott, *Sk.* i. 451. — De Candolle, *Prodr.* i. 595. — Sprengel, *Syst.* ii. 224. — Don, *Gen. Syst.* i. 649. — Spach, *Hist. Veg.* iii. 118; *Ann. Sci. Nat.* ser. 2, ii. 178. — Torrey & Gray, *Fl. N. Am.* i. 249, 684. — Hooker, *Fl. Bor.-Am.* i. 113 (in part). — Sargent, *Garden and Forest*, ii. 364.

A. saccharinum, Wangenheim, *Nordam. Holz.* 26, t. 11, f. 26 (not Linnæus). — Lamarck, *Dict.* ii. 379. — Castiglioni, *Viag. negli Stati Uniti*, ii. 171. — Schmidt, *Oestr. Baum.* i. 12, t. 8. — Walter, *Fl. Car.* 251. — Aiton, *Hort. Kew.* iii. 434. — Ehrhart, *Beitr.* iv. 24. — Persoon, *Syn.* i. 417. — *Nouveau Duhamel*, iv. 29, t. 8. — Willdenow, *Spec.* iv. 985; *Enum.* 1044. — Desfontaines, *Hist. Arb.* i. 392. — Trattinick, *Archiv.* i. t. 3. — Michaux f. *Hist. Arb. Am.* ii. 218, t. 15. — Bigelow, *Fl. Boston.* 247. — Pursh, *Fl. Am. Sept.* i. 266. — Nuttall, *Gen.* i. 253; *Sylva*, ii. 88. — Hayne, *Dendr. Fl.* 214. — Elliott, *Sk.* i. 450. — De Candolle, *Prodr.* i. 595. — Torrey, *Fl. N. Y.* i. 135. — Sprengel, *Syst.* ii. 225. — Hooker, *Fl. Bor.-Am.* i. 113. — Don, *Gen. Syst.* i. 650. — Spach, *Hist. Veg.* iii. 99; *Ann. Sci. Nat.* ser. 2, ii. 170. — Loudon, *Arb. Brit.* i. 411, f. 122, t. — Torrey & Gray, *Fl. N. Am.* i. 248. — Dietrich, *Syn.* ii. 1282. — Walpers, *Rep.* i. 409. — Nees, *Pl. Med.* 5. — Emerson, *Trees Mass.* ed. 2, ii. 558, t. — Gray, *Gen. Ill.* ii. 200, t. 174. — Darlington, *Fl. Cestr.* ed. 3, 45. — Chapman, *Fl.* 80. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 51. — Bell, *Geolog. Rep. Canada*, 1879–80, 51[c]. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 62. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 48. — Pax, *Engler Bot. Jahrb.* vii. 241. — Watson & Coulter, *Gray's Man.* ed. 6, 117. — Wesmael, *Gen. Acer*, 44.

A. saccharophorum, Koch, *Hort. Dendr.* 80.

A. Saccharum, Britton, *Cat. Pl. N. J.* 78 (not Marshall). — Hitchcock, *Trans. St. Louis Acad.* v. 490.

A noble tree, a hundred or a hundred and twenty feet high, with a trunk three or four feet in diameter, rising sometimes in the forest to the height of sixty or seventy feet without a branch, or in open situations developing, eight or ten feet from the ground, stout upright branches which form, while the tree is young, a narrow egg-shaped head, and begin to spread when it is fifty or sixty years old, gradually making a broad round-topped dome often seventy or eighty feet across. The bark of large trunks is from a half to three quarters of an inch thick, and is broken into deep longitudinal furrows, the light gray-brown surface separating into small scales. The bark of the young trunks and of the principal branches is pale and smooth or slightly fissured. The branchlets are green when they appear, but by the end of the first season become orange-brown; they are then lustrous and marked with numerous large pale oblong lenticels, and are encircled at the base with the scars left by the falling of the accrescent inner bud-scales; in the second winter they are pale brown tinged with red, and are still faintly marked with lenticels. The winter-buds are acute, a quarter of an inch in length, and covered with about sixteen purple slightly puberulous pointed scales imbricated in pairs, those of the outer pairs being much reduced in size. The inner scales lengthen with the growing shoot until at maturity they are an inch and a half long, narrowly obovate, contracted at the apex into a short blunt point, thin, coated with pubescence, and bright canary-yellow. The leaves are three to five-lobed with rounded sinuses and usually acute sparingly sinuate-toothed lobes, and with three to five conspicuous pale primary veins and reticulated veinlets; they are heart-shaped by a broad or narrow sinus, or truncate or sometimes wedge-shaped at the base, densely coated when they unfold with pale tomentum, glabrous or more or less pubescent on the under surface at maturity, four or five inches across, often rather coriaceous, dark green and opaque on the upper, and generally paler on the lower surface. They

turn in autumn to brilliant shades of deep red, scarlet, and orange, or of clear yellow.[1] The flowers are produced in many-flowered nearly sessile umbel-like corymbs from terminal leafy buds and from lateral leafless buds; the sterile and fertile flowers are in separate clusters on the same or on different trees, the fertile flowers terminal and the sterile usually lateral. They appear with the leaves, and are greenish yellow and borne on slender thread-like hairy pedicels two and a half to three inches in length. The calyx is broadly campanulate, five-lobed by the partial union of the obtuse sepals, and hairy on the outer surface. There are seven or eight stamens with slender glabrous filaments which, in the sterile flower, are twice as long as the calyx, and in the fertile flower much shorter. The ovary, which in the sterile flower is reduced to a minute point, is obtusely lobed, pale green, and covered with long scattered hairs. The styles are united at the base only, and have two long exserted stigmatic lobes. The fruit, which ripens in the autumn, is glabrous; the wings vary from half an inch to rather more than an inch in length, and are broad, thin, and usually divergent. The seed is a quarter of an inch long, with a smooth bright red-brown coat and foliaceous thick cotyledons.[2]

Acer barbatum is one of the most widely and generally distributed trees of eastern North America. The northern limit of its range on the Atlantic coast is southern Newfoundland; it extends southward through Canada and the northern states and along the Alleghany Mountains to northern Georgia and western Florida, and westward along the valleys of the St. Lawrence and the Saguenay, by the shores of Lake St. John and the northern borders of the Great Lakes to the Lake of the Woods, and in the United States to Minnesota, eastern Nebraska, eastern Kansas, and eastern Texas. It is one of the common trees in all these regions, especially at the north and on the slopes of the southern mountains, growing on rich uplands and on intervale lands mingled with Ashes and Hickories, the White Oak, the Wild Cherry, the Black Birch, the Yellow Birch, and the Hemlock; or often at the north forming the principal part of extensive forests.[3]

The wood of *Acer barbatum* is heavy, hard, strong, close-grained, and tough, with a fine satiny surface susceptible of receiving a good polish; it is light brown tinged with red, with thin sapwood composed of thirty or forty layers of annual growth, and contains numerous thin medullary rays. The specific gravity of the absolutely dry wood is 0.6912, a cubic foot weighing 43.08 pounds. The wood of the Sugar Maple is more valuable and more generally used than that of any other American Maple. It possesses a high fuel value, burning with a clear steady flame; it is largely used for the interior finish of buildings, especially for floors, in the manufacture of furniture and in turnery, in shipbuilding for keels, keelsons, shoes, etc., for the handles of tools, and for saddle-trees; and in the United States shoe-lasts and pegs are made almost exclusively from this wood. Accidental forms in which the grain is beautifully curled and contorted, known as "curled maple" and "bird's eye maple," are common and highly prized in cabinet-making. The ashes of the wood are rich in alkali and yield large quantities of potash; and maple-sugar is principally made from the sap of this species.[4]

[1] Much of the splendor of the northern forest in early autumn is due to the abundance of the Sugar Maple, which is then unsurpassed in brilliancy of color by any upland tree. Individuals vary in the time and in the manner of assuming their autumn colors, but such peculiarities appear fixed and are certainly renewed year after year. All the leaves on a single branch sometimes turn bright scarlet early in October, while the rest of the foliage remains green. On some trees a part of the leaves turn scarlet and a part orange or yellow; on others all the leaves assume shades of bright clear yellow, and on others a few leaves become red or yellow on different parts long before the remainder lose their dark green summer color.

[2] The fruit of *Acer barbatum*, although it usually appears to be fully developed, is often abortive; and it is rare to find perfect seed in each of the two carpels, or a tree which produces seed every year.

[3] It is not unusual to find the undergrowth in some of the forest regions near the northern border of the United States composed almost entirely of young Sugar Maples; and the multiplication of this tree is insured and its value in forest composition increased by the remarkable ability it possesses while young to grow under the dense shade of other trees.

[4] Sugar-making begins with the upward flow of the crude sap, or between the end of February and the beginning of April, as the season is early or late, and continues during three or four weeks. Trees twenty or thirty years old are considered the most productive and yield the purest sugar, although sap can be drawn from the tree year after year without seriously injuring it. Trees exist in northern New York which are known to have yielded sugar every year for a century, and which, while much swollen about the base from repeated wounds, are still vigorous and fruitful. A tree of the average size will give in an ordinary season twenty or thirty

Acer barbatum, like many species of the genus, varies greatly in the size and shape of its leaves. The most generally distributed of the varieties, and one of the most marked in its extreme forms, is the Black Maple, first noticed by the younger Michaux on the banks of the Genesee River in New York, where it still forms a forest of considerable size. The leaves of the Black Maple[1] are usually three-

gallons of sap, usually containing from two to three per cent. of sugar, or from two and two thirds to three and a half ounces per gallon. Individual trees, however, vary much in productiveness; and those standing by themselves on high ground, with a large development of roots and branches, generally yield more sap than trees crowded together in the forest. The highest percentage of sugar recorded is 10.20 for a tree in Vermont in a small flow late in the season, 5.01 per cent. being the average of this tree during the season (Wiley, *Bull.* 51, *Chemical Div. Dept. Agric.* 1885).

The primitive method of obtaining the sap consisted in cutting with an axe into the side of the tree, two or three feet from the ground, a notch slanting a little upward in order that the sap might drop from the lower end into a concave wooden spout about a foot long which was inserted in the bark below the notch, and from which it then flowed into a cedar pail placed upon the ground or hung upon a nail driven in the trunk. Such a notch, although it yields a rapid flow owing to the large surface exposed, injures the tree, and is now seldom used; instead, one or generally two holes are bored about three quarters of an inch into the trunk on the south side of the tree with a three-quarter-inch auger, and into these holes are driven short spouts made by hollowing out pieces of Elder or Sumach wood. The sap is collected from the pails every day and carried to the sugar camp established at a central and convenient spot; here it is allowed to evaporate for a short time, when it is boiled to the consistency of honey in kettles or in shallow copper or iron pans made for the purpose. It is then dipped from the pans, passed through a woolen strainer, and allowed to stand for eight or ten hours to deposit suspended impurities. This part of the process is called "syruping off," and much of the product is sold without further concentration in the form of maple-syrup. When the syrup is to be converted into sugar it is carefully poured into a kettle for the final process called "sugaring off," and boiled over a brisk fire. To prevent the syrup from boiling over, a few drops of cream are occasionally added, or a piece of fat pork is hung on a string a few inches below the rim of the pot, and cold sap, milk, or the white of eggs, is added from time to time to clarify it. It is kept simmering over a slow fire until a heavy scum rises to the surface; this is skimmed off and it is again boiled until it reaches the proper consistency. This is determined by stirring a small quantity in a saucer, when, if it grains, the syrup has been sufficiently boiled; or by spreading it on the snow, when it should candy or become like glass as it grows cold. If the test is satisfactory, the syrup is poured into moulds and allowed to cool, when it is ready for market.

Maple-sugar has the appearance of raw cane-sugar, except that it is rather darker in color, and it loses in refining the peculiar flavor for which it is valued. It often contains a considerable percentage of melite of lime, a substance that feels like sand in the mouth, and seems to increase in quantity in proportion to the length of time the tree has been tapped. (See Lahontan, *Nouveaux Voyages dans l'Amérique Septentrionale*, ii. 59. — Castiglioni, *Viag. negli Stati Uniti*, ii. 180; also an account of the Sugar-tree in a letter addressed to Thomas Jefferson by Dr. Benjamin Rush of Philadelphia, published in the third volume of the *Transactions of the American Philosophical Society*, 64. — Guibourt, *Hist. Drog.* ed. 7, iii. 606. — J. G. Jack, *Garden and Forest*, ii. 302.)

About 40,000,000 pounds of maple-sugar and 2,000,000 gallons of maple-syrup are made annually in the forests of the United States, — Vermont, New York, and Michigan producing the largest quantities. The yield will probably decrease rather than increase in volume as the Maple forests are destroyed and the price of other sugars is lowered. Land covered with sugar orchards is still considered, however, the most productive part of many farms in some parts of the northern states, and orchards are occasionally planted, although a large part of the maple-sugar produced in the United States is obtained from the forests or from natural groves left standing when the forests were cut away.

The testimony of early travelers in North America shows that the nutritious and sugary properties of the sap of the Maple and of other trees were well known to and made use of by the Indians before the earliest settlement of Europeans in New France or in New England, and that the making of maple-sugar was an established industry of the Indians during the last half of the seventeenth century, and before the discovery of the upper Mississippi River by Europeans (1673). Bossu, a French officer of much intelligence who traveled in America between 1756 and 1771, states explicitly that the French learned the method of sugar-making from the Indians (*Nouveaux Voyages dans l'Amérique Septentrionale*, 237); and the testimony of earlier travelers points to the same conclusion (see Lescarbot, *Histoire de la Nouvelle France*, ed. 1618, lib. vi. chap. xvi. 865. — Sagard, *Grande Voyage*, 102. — Pierre Boucher, *Histoire Veritable et Naturelle de la Nouvelle France*, 44. — Nicolas Denys, *Histoire Naturelle de l'Amérique Septentrionale*, ii. 316. — Leclercq, *Etablissement de la Foy*, i. 252; *Nouvelle Relation de la Gaspesie*, chap. vi. 124. — Joutel, *Journal Historique*, 352. — Rasles, *Lettres Edifiantes*, iv. 83. — Lafitau, *Moeurs des Sauvages Américains comparées aux moeurs des premiers temps*, i. 188. — James Smith's *Captivity*, 36, 68. — See, also, a paper on the evidence relating to sugar-making by the Indians, by H. W. Henshaw in the *American Anthropologist*, iii. 341, and a paper by A. F. Chamberlain in the same magazine, iv. 39, on *The Maple amongst the Algonkian Tribes;* and papers by William D. Ely in *Garden and Forest*, iv. 171, 183, 207).

[1] *Acer barbatum*, var. *nigrum*, Sargent, *Garden and Forest*, ii. 364; iv. 148, f. 27.

A. nigrum, Michaux f. *Hist. Arb. Am.* ii. 238, t. 16. — Pursh, *Fl. Am. Sept.* i. 266. — Poiret, *Lam. Dict.* Suppl. v. 669. — Nuttall, *Gen.* i. 253. — Elliott, *Sk.* i. 450. — De Candolle, *Prodr.* i. 595. — Sprengel, *Syst.* ii. 225. — Don, *Gen. Syst.* i. 650. — Spach, *Hist. Veg.* iii. 104; *Ann. Sci. Nat.* ser. 2, ii. 170. — Dietrich, *Syn.* ii. 1282. — Koch, *Dendr.* i. 532. — Bailey, *Bot. Gazette*, xiii. 213.

A. saccharinum, var. *nigrum*, Torrey & Gray, *Fl. N. Am.* i. 248. — Torrey, *Fl. N. Y.* i. 136. — Loudon, *Arb. Brit.* i. 411. — Bell, *Geolog. Rep. Canada*, 1879–80, 54. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 49. — Watson & Coulter, *Gray's Man.* ed. 6, 117.

A. Rugelii, Pax, *Engler Bot. Jahrb.* vii. 243.

Acer saccharinum, var. *pseudo-platanoides*, Pax, *Engler Bot. Jahrb.* vii. 242. — Wesmael, *Gen. Acer*, 45.

Acer saccharinum, var. *glaucum*, Pax, *Engler Bot. Jahrb.* vii. 242. — Wesmael, *Gen. Acer*, 45.

A. saccharinum, var. *Rugelii*, Wesmael, *Gen. Acer*, 45.

lobed with entire or bluntly toothed lobes, and often appear almost peltate by the overlapping of the sides of the deep narrow basal sinus. They are frequently thinner than those of the common form of the Sugar Maple, are usually green on the lower surface, which is often villous-pubescent, especially along the principal veins and on the petioles, and sometimes are six or eight inches across, although varying considerably in size.[1] The Black Sugar Maple is generally found on lower ground than the common form, occupying, as a rule, the banks of streams or rich alluvial river-bottom lands. It has been noticed on the shores of Lake Champlain in Vermont, and spreads as far west as southwestern Arkansas and eastern Kansas, ranging southward west of the Alleghany Mountains to northern Alabama and to the valley of the Chickasaw River in Mississippi.[2]

Acer barbatum in the Gulf states passes into a form[3] having small three to five-lobed leaves an inch and a half to three inches across, with obtuse entire or obscurely toothed lobes, truncate or slightly cordate at the base, and pale and sometimes thickly covered by hairy pubescence on the lower surface, and having flowers and fruit barely half the size of those of the ordinary form, the wings of the samaras rising nearly at right angles from the nutlets. This is a small tree inhabiting upland woods, and in western Texas, where it is reduced to a low shrub, found only along the banks of streams. It is nowhere common, although distributed from western Florida to the valley of the upper Cibolo River in Texas, and the Sierra Madre of Nuevo Leon.

Acer barbatum reappears in the mountainous regions of the interior of the continent in another form[4] very similar to the last. The leaves of the mountain Sugar Maple are three-lobed and slightly cordate or truncate at the base, with broad shallow sinuses and acute or obtuse lobes which have nearly entire or sinuous margins, or sometimes are somewhat three-lobed; they are two or three inches across, rather pale on the upper, much paler and at maturity slightly pubescent on the lower surface along the principal veins, and are borne on slender petioles an inch or an inch and a half long; the flowers and fruit[5] are smaller than those of the eastern tree. This is a small tree, rising occasionally to the height of thirty or forty feet, with a trunk eight or ten inches in diameter covered with thin dark brown bark, the surface of which separates into plate-like scales. It grows at an elevation of from five to six thousand feet above the sea-level, and is rare and local, forming occasionally with the Aspen small groves on the banks of streams. It occurs on the headwaters of the Columbia River in northern Montana,

[1] Professor L. H. Bailey calls attention to the fact that the sides of the large leaves of the Black Maple as it grows in some parts of central Michigan droop and hang down like pieces of old limp thick cloth. This peculiarity is particularly noticeable when the leaves are fully grown, and gives the tree a heavier and duller aspect than that of the common Sugar Maple, making it possible to distinguish the two trees at some distance (*Popular Gardening*, iii. 24; *Bot. Gazette*, xiii. 214). More remarkable is the occasional occurrence on some Indiana and Michigan trees of large foliaceous and caducous puberulous or small rudimentary stipules, organs otherwise unknown in the genus. (A. Gray, *Am. Nat.* vi. 764; vii. 422. — Wheeler, *Cat. Mich. Pl.* 23. — Bailey, *l. c.*) They are apparently abnormal, although reproduced year after year on some trees, and cannot be relied on to distinguish this plant specifically, as no trace of them appears on such specimens from other parts of the country as I have been able to examine. Extreme forms of the Black Maple, like those found in Michigan, are easily recognized and appear distinct, but they seem to pass gradually by many intermediate forms into the plant which is usually regarded as the type of the species, and it is not easy to find characters sufficiently constant to establish satisfactorily the Black Maple even as a variety.

[2] The wood of the Black Maple is not distinguishable from that of the common Sugar Maple, and is used commercially for the same purposes. The specific gravity of the absolutely dry wood as shown by the Census tests is 0.6915, a cubic foot weighing 43.09 pounds.

[3] *Acer barbatum*, var. *Floridanum*, Sargent, *Garden and Forest*, iv. 148.

A. saccharinum, var. *Floridanum*, Chapman, *Fl.* 80. — Wesmael, *Gen. Acer*, 45.

A. Mexicanum, Gray, *Proc. Am. Acad.* v. 176. — Hemsley, *Bot. Biol. Am. Cent.* i. 214.

A. Floridanum, Pax, *Engler Bot. Jahrb.* vii. 243.

[4] *Acer barbatum*, var. *grandidentatum*, Sargent, *Garden and Forest*, iv. 148.

Acer grandidentatum, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 247; *Sylva*, ii. 82, t. 69. — Dietrich, *Syn.* i. 1283. — Walpers, *Rep.* i. 409. — Watson, *King's Rep.* v. 52; *Pl. Wheeler*, 7. — Parry, *Am. Nat.* ix. 201, 268. — Rothrock, *Wheeler's Rep.* vi. 83. — Rusby, *Bull. Torrey Bot. Club*, ix. 106. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 48. — Pax, *Engler Bot. Jahrb.* vii. 220. — Wesmael, *Gen. Acer*, 30.

[5] In a specimen collected by Professor H. H. Rusby on the Mogollon Mountains, and in specimens gathered by Marcus E. Jones in Utah, the fruit is as large and hardly distinguishable from that of the eastern Sugar Maple. Occasionally, however, it is not half so large; and on a specimen collected by Pringle in the Huachuaca Mountains on the first of July, the fruit is apparently fully grown and has small pink wings.

where it was discovered by Thomas Nuttall, on the Wahsatch Mountains of Utah, on the Huachuaca and other ranges of southern Arizona, and on the Mogollon Mountains of New Mexico, the Guadaloupe Mountains of western Texas, and the ranges of Coahuila.

The wood of *Acer barbatum*, var. *grandidentatum*, is heavy, hard, and very close-grained; it is light brown or sometimes nearly white, with thick sapwood and thin remote medullary rays. The specific gravity of the absolutely dry wood is 0.6902, a cubic foot weighing 43.01 pounds.[1]

Acer barbatum, var. *grandidentatum*, was introduced into the Arnold Arboretum in 1882; it grows very slowly, and probably will be of little value as an ornamental tree.

The Sugar Maple, strangely enough, escaped the attention of the early botanists who examined the forests of North America, and it was not known to Linnæus. Wangenheim,[2] whose work on American trees was published in Germany in 1787, first described it, although it is stated by Aiton[3] that the Sugar Maple was introduced into England by Peter Collinson[4] in 1735. The hardiness of the Sugar Maple, its rapid growth in good soil, its excellent habit, the grace of its flowers, the beauty of its foliage especially in autumn, and its freedom from serious disease make it one of the most valuable ornamental trees of North America, and it is now planted in immense numbers in the northern states for shade and for the embellishment of streets, roadsides, and parks.[5]

[1] This tree, as might be expected from the aridity and the high elevation of the regions it inhabits, grows very slowly. The specimen which represents it in the Jesup Collection of North American Woods in the American Museum of Natural History in New York, and which was gathered in Utah, is eight and three quarter inches in diameter, and shows one hundred and forty layers of annual growth with eighty-five layers of sapwood.

[2] Wangenheim, misled no doubt by the name *saccharinum* bestowed by Linnæus upon another American Maple, transferred it to the true Sugar Maple; and his name has been adopted by nearly every author who has since written of this tree.

[3] *Hort. Kew.* iii. 435.

[4] See i. 8.

[5] The Sugar Maple, like the Hickories, the White Oaks, and other upland trees of eastern America, does not flourish in the Old World, and really fine specimens, if they exist at all in Europe, are extremely rare, although one hundred and fifty years have passed since it was introduced, and at different times considerable attention has been given to its cultivation. It is now seldom planted in Europe, and this accounts, perhaps, for the fact that no marked seminal varieties of the Sugar Maple have been developed in cultivation; for it is not probable that this tree would show less tendency to vary in the shape of its leaves than other Maples, had it been raised in nurseries from seed in as great numbers. The trees planted in America are seldom obtained in this manner, being generally taken from the forest.

EXPLANATION OF THE PLATES.

Plate XC. Acer barbatum.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, natural size.
9. Vertical section of a seed, enlarged.
10. An embryo, much magnified.
11. A winter branchlet, natural size.

Plate XCI. Acer barbatum.

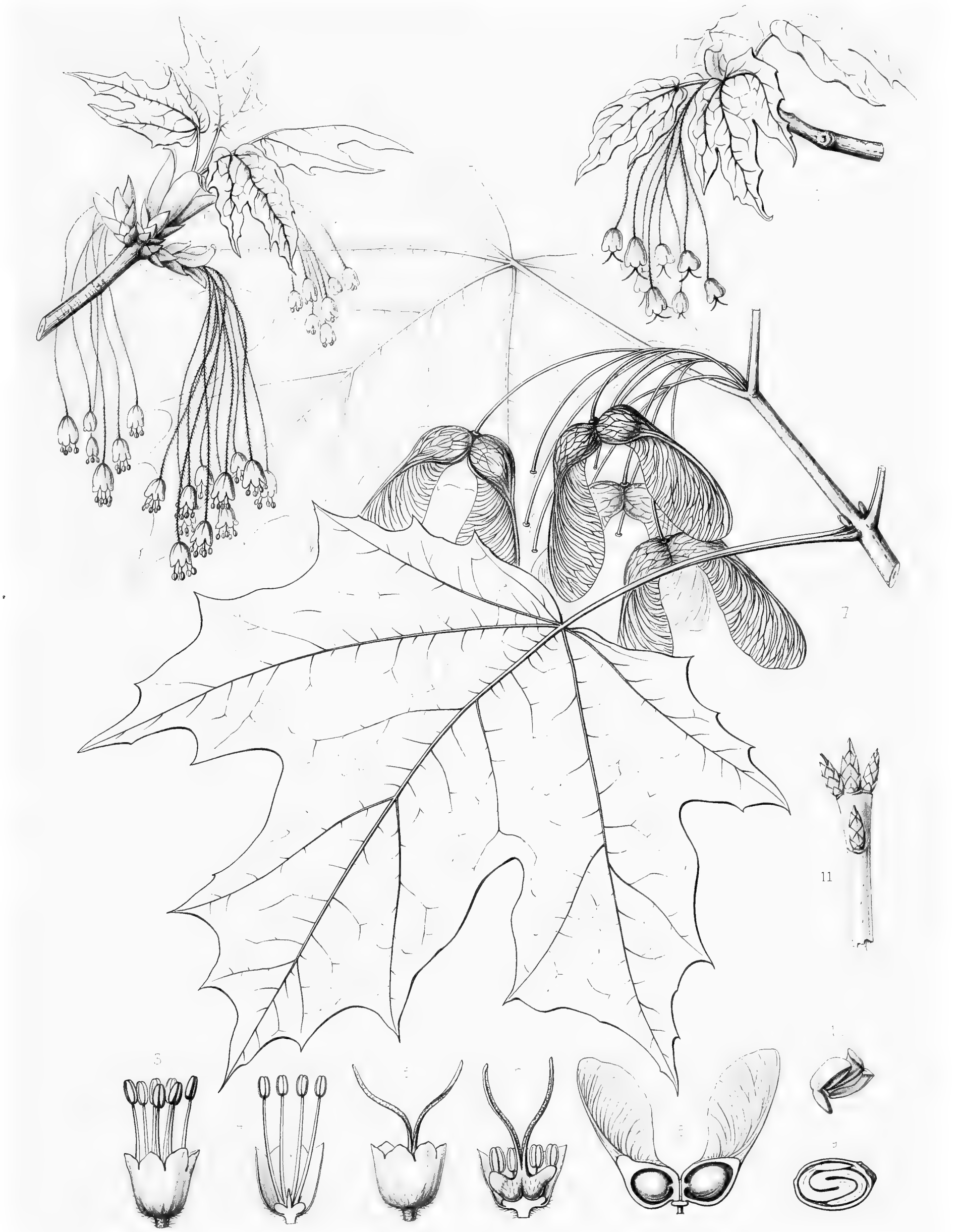
1, 2, 3. Var. nigrum.

4. Var. Floridanum.

Plate XCII. Acer barbatum, var. grandidentatum.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. A pistillate flower, the calyx removed, enlarged.
7. Vertical section of an ovary, enlarged.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, enlarged.
10. Vertical section of a seed, enlarged.
11. An embryo, much magnified.
12. A winter branchlet, natural size.

Silva of North America.



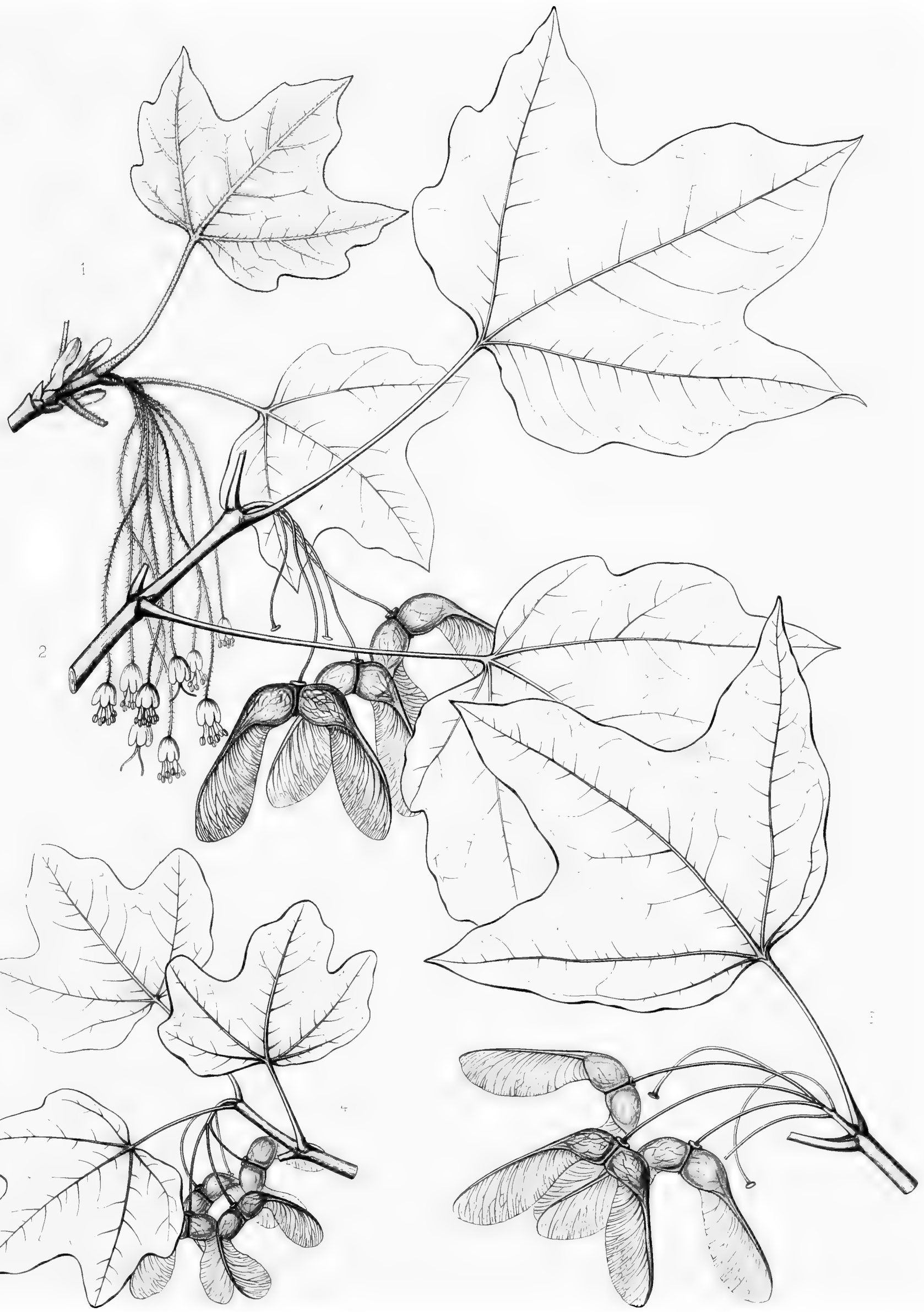
C E. Faxon del

Picart fr. sc.

ACER BARBATUM, Michx.

A Riocreux direx.t

Imp. R Laneur, Paris.



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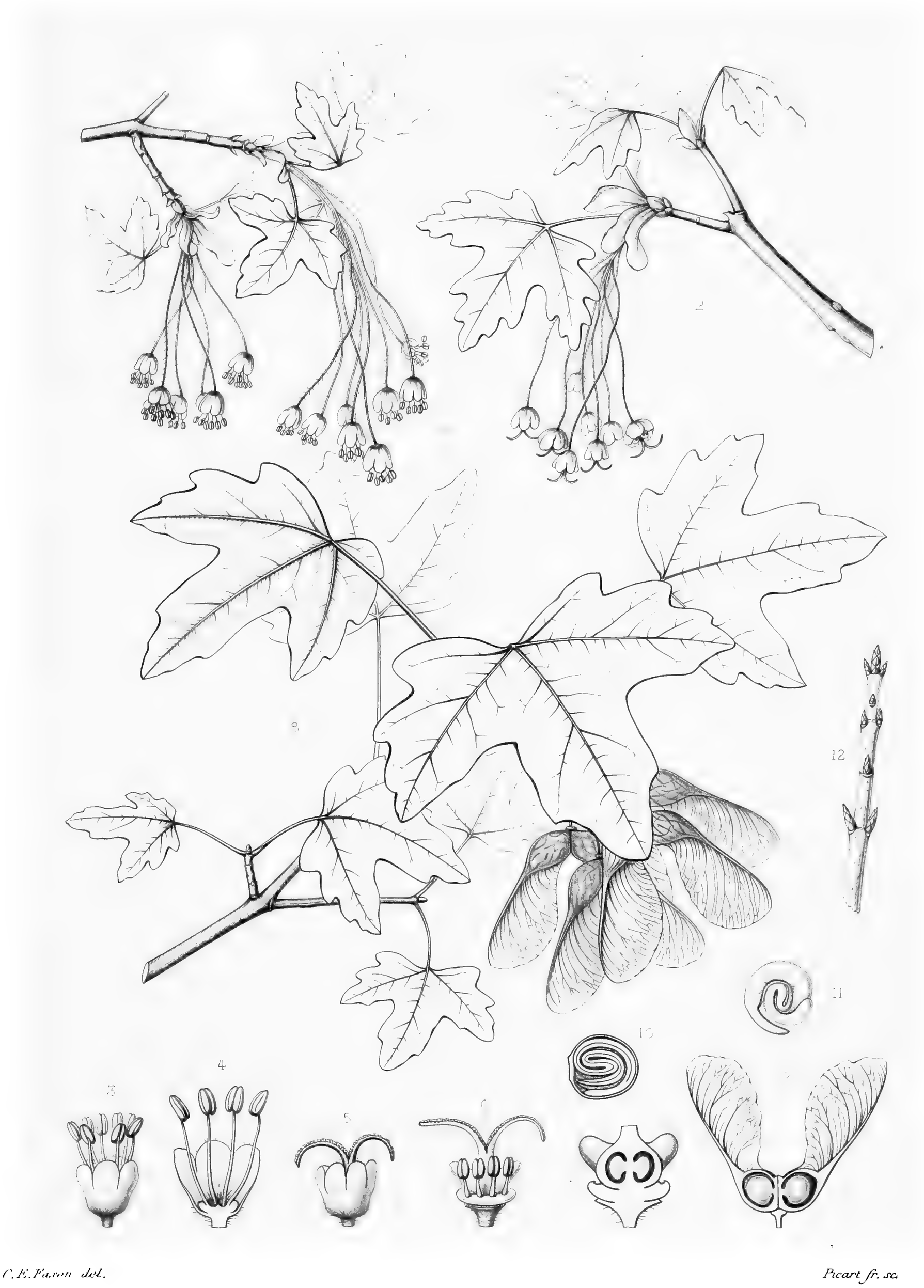
1.2.3 ACER BARBATUM, Var. NIGRUM, Sarg.

4 ACER BARBATUM, Var FLORIDANUM, Sarg.

A. Riocreux direx.t Imp. R. Taneur. Paris.



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ACER BARBATUM, Var GRANDIDENTATUM, Sarg.

A. Riocreux direx.t Imp. R. Taneur Paris

ACER SACCHARINUM.

Silver Maple. Soft Maple.

Flowers sessile in axillary fascicles; ovary and young fruit tomentose. Leaves deeply 5-lobed.

Acer saccharinum, Linnæus, *Spec.* 1055. — Koch, *Hort. Dendr.* 80. — Sargent, *Garden and Forest*, ii. 364.

A. Saccharum, Marshall, *Arbust. Am.* 4.

A. rubrum, Lauth, *De Acere*, 11 (not Linnæus). — Lamarck, *Dict.* ii. 380 (excl. var. β.).

A. dasycarpum, Ehrhart, *Beitr.* iv. 24. — Moench, *Meth.* 56. — Persoon, *Syn.* i. 417. — Willdenow, *Spec.* iv. 985; *Enum.* 1044. — Aiton, *Hort. Kew.* ed. 2, v. 446. — Pursh, *Fl. Am. Sept.* i. 266. — Nuttall, *Gen.* i. 252; *Sylva*, ii. 87. — Hayne, *Dendr. Fl.* 213. — Elliott, *Sk.* i. 449. — Torrey, *Fl. N. Y.* i. 136, t. 18. — Sprengel, *Syst.* ii. 225. — Tausch, *Regensb. Fl.* xii., ii. 553. — Hooker, *Fl. Bor.-Am.* i. 113. — Bigelow, *Fl. Boston.* ed. 3, 407. — Torrey & Gray, *Fl. N. Am.* i. 248. — Emerson, *Trees Mass.* ed. 2, ii. 556, t. — Darlington, *Fl. Cestr.* ed. 3, 46. — Chapman, *Fl.* 81. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 51. — Buchenau, *Bot. Zeit.* xix. 285, t. 11, f. 17, 18, 18ª, 26, 27. — Koch, *Dendr.* i. 541. — Bell, *Geolog. Rep. Canada*, 1879–80, 53ᶜ. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 62. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 49. — Pax, *Engler Bot. Jahrb.* vii. 179. — Watson & Coulter, *Gray's Man.* ed. 6, 117. — Wesmael, *Gen. Acer*, 11.

A. rubrum mas, Schmidt, *Oestr. Baum.* i. 11, t. 7.

A. rubrum, var. **pallidum**, Aiton, *Hort. Kew.* iii. 434.

A. eriocarpum, Michaux, *Fl. Bor.-Am.* ii. 253. — Desfontaines, *Ann. Mus.* vii. 412, t. 25, f. 1; *Hist. Arb.* i. 392. — Poiret, *Lam. Dict.* Suppl. ii. 573. — Trattinick, *Archiv.* i. t. 8. — Michaux f. *Hist. Arb. Am.* ii. 205, t. 13. — *Nouveau Duhamel*, iv. 30. — De Candolle, *Prodr.* i. 595. — Don, *Gen. Syst.* i. 650. — Spach, *Hist. Veg.* iii. 116; *Ann. Sci. Nat.* ser. 2, ii. 177. — Darlington, *Fl. Cestr.* 116; ed. 2, 245. — Dietrich, *Syn.* ii. 1282.

A large tree, ninety to a hundred and twenty feet high, with a trunk three or four feet in diameter, which generally divides, ten or fifteen feet from the ground, into three or four stout upright secondary stems destitute of branches for a considerable length, and brittle pendulous branchlets. The bark of the trunk is from a half to three quarters of an inch thick, reddish brown and more or less furrowed, its surface separating into large thin scales. The bark of the young stems and large branches is smooth and gray tinged with red. The branchlets are at first light green and covered with lenticels, but soon become darker, and in the autumn and winter of their first year are bright chestnut-brown with a smooth and very lustrous surface, and are covered with large pale lenticels, and indistinctly marked at the base with the scars left by the falling of the inner bud-scales; in the second season they are pale rose-colored or gray faintly tinged with red, the lenticels then being of the same color as the remainder of the bark. The leaf-buds are an eighth of an inch long and covered with thick ovate bright red imbricated scales rounded on the back, minutely apiculate, and ciliate along the margins; those of the inner ranks are pale green or yellow, an inch long at maturity, acute, pubescent on the inner surface, and caducous. The leaves are deeply five-lobed by narrow sinuses with acute irregularly and remotely dentate divisions, the middle lobe often being three-lobed; they are truncate or somewhat heart-shaped at the base, six or seven inches in length and rather less in breadth, membranaceous, bright pale green on the upper surface, and silvery white and at first slightly hairy, especially in the axils of the primary veins, on the lower surface, and are borne on slender drooping bright red petioles four or five inches long. They turn pale yellow in the autumn before falling. The flowers are produced in sessile axillary fascicles on shoots of the previous year, or on short spur-like branchlets developed the year before from the wood of the preceding season. The staminate and pistillate flowers appear in separate clusters, sometimes together and sometimes on different trees, and are produced from aggregated obtuse buds covered with thick ovate pubescent red and green scales furnished on the margin with a thick fringe of long rufous hairs. They are greenish yellow and destitute of petals, and open during the

first warm days of the late winter or early spring, and long before the appearance of the leaves, which do not unfold until the fruit is nearly grown. The calyx is slightly five-lobed, more or less pubescent on the outer surface, long and narrow in the sterile, and short and broad in the fertile flower. There are from three to seven stamens with slender filaments which in the sterile flower are three times as long as the calyx, and in the fertile flower about the length of the calyx. The ovary, which is rudimentary in the sterile flower, is borne on a narrow disk and is covered, as is the young fruit, with a thick coat of pubescence; the styles are united at the base only and have long exserted stigmatic lobes. The fruit is borne on slender drooping pedicels an inch and a half or two inches long, and ripens in April or May; the samaras vary in length from an inch and a half to nearly three inches, and have thin almost straight or conspicuously falcate divergent wings which are sometimes three quarters of an inch broad and are prominently reticulate-veined and pale chestnut-brown.[1] The seed is half an inch long, with a pale reddish brown wrinkled testa and an almost straight embryo with thin foliaceous cotyledons and a short radicle; it germinates as soon as it falls to the ground, producing plants with several pairs of leaves before the end of the summer.

Acer saccharinum is found in the north from the valley of the St. John River in New Brunswick to southern Ontario; it extends southward through the United States to western Florida, and westward to eastern Dakota and Nebraska, to the valley of the Blue River in Kansas, and to the Indian Territory. It grows on the sandy banks of clear streams which, with Willows and the Red Birch, it lines in some parts of the country, especially in the valley of the Mississippi, where it is one of the largest and most common of the river-trees. The Silver Maple is rare in the immediate neighborhood of the Atlantic coast or among the high Appalachian Mountains; it reaches its greatest size on the banks of the lower Ohio and its tributaries, and there forms one of the most characteristic and beautiful features of the forest vegetation.

The wood of *Acer saccharinum* is hard, strong, close-grained, and easily worked, but rather brittle; it is pale, faintly tinged with brown, with thick sapwood composed of forty or fifty layers of annual growth, and many thin medullary rays. The specific gravity of the absolutely dry wood is 0.5269, a cubic foot weighing 32.84 pounds. It is now sometimes used for flooring and in the manufacture of cheap furniture. Sugar is occasionally produced from the sap.

Acer saccharinum appears to have been first distinguished by the Swedish traveler Kalm, who sent it to Linnæus. It was introduced into English gardens in 1725 by Sir Charles Wager. The Silver Maple grows very rapidly in cultivation,[2] even on dry soil, and for this reason was planted at one time in immense numbers in the northern states as a shade and street tree. When it has grown under favorable conditions it forms a wide-spreading head, beautiful in the play of light and shade through the deeply divided leaves dancing with the slightest breath of wind on their slender stems and displaying the silvery whiteness of their lower surface. On dry and elevated ground, however, it is not handsome except when young; the branches become brittle and are easily broken, and the habit is loose and unattractive; and the Silver Maple is now much less frequently planted in this country than it was fifty years ago. It grows almost as well in Europe as it does in its native country, and numerous varieties have been found in American and European nurseries with variously cut and marked leaves and with more or less pendulous branches.[3]

[1] When this tree is enticed into expanding its flower-buds by the succession of a few unnaturally warm days in winter, its fruit is often entirely destroyed by spring frosts. Not infrequently only one of the two carpels is developed, the other appearing as a small rudiment.

[2] The Silver Maple is a fast-growing tree, even after it has attained a large size. The great tree on the meadows in Northampton, Massachusetts, mentioned by Emerson (*Trees Mass.* 489), had a trunk circumference at three and a half feet from the ground of twelve feet six inches in 1837. Fifty-two years later the trunk, which had become hollow and much decayed, measured at the same distance from the ground seventeen feet four inches.

[3] Pax (*Engler Bot. Jahrb.* vii. 180) proposes the following subvarieties for variously cultivated seminal forms of this tree: —

Var. *normale* (*A. lutescens*, Hort., Wittmack, *Gartenz.* 1883, 513. *A. macrophyllum*, *A. Pavia*, *A. palmatum*, *A. spicatum*).

None of these seedling varieties are very distinct or possess greater beauty than the type.

Var. *cuneatum* (*A. sanguineum*, Hort., *A. pendulum*, Hort., *A. longifolium*, Hort.).

Var. *albo-maculatum* (*A. albo-variegatum*, Hort., *A. pulverulentum*, Wittmack, *l. c.*).

Var. *laciniatum* (*A. laciniatum Wierii*, Hort., *A. heterophyllum*, Hort.).

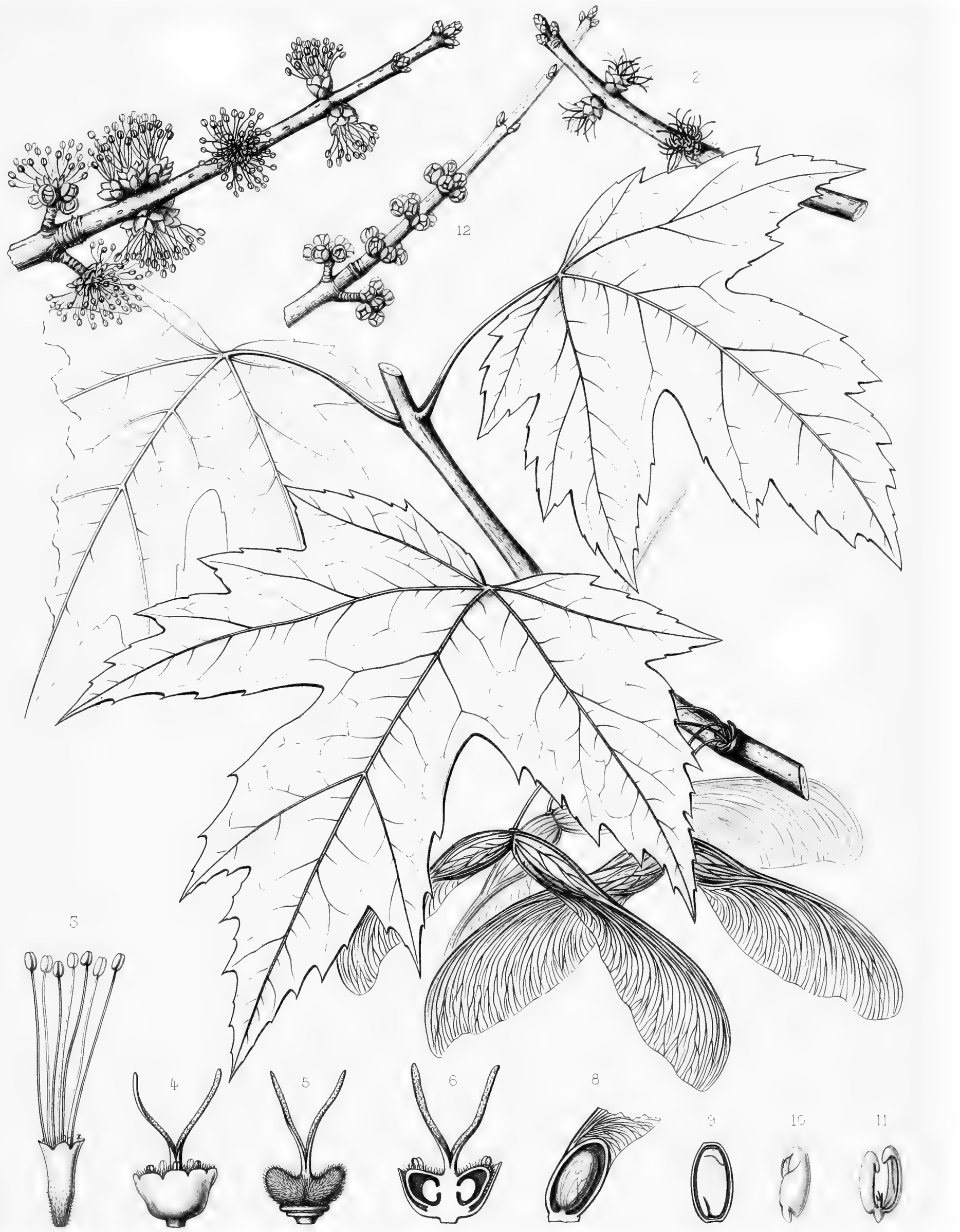
Var. *dissectum* (*A. dissectum Wagneri*, Hort.).

A. saccharinum is found in gardens, too, under the name of *A. album*, *A. coccineum*, *A. dasycarpum monospermum*, *A. Floridanum*, *A. Floridum*, *A. hybridum*, *A. macrocarpum*, *A. Saira*, *A. tomentosum*, and *A. Virginicum rubrum* (Nicholson, *Gard. Chron.* n. ser. xv. 137).

EXPLANATION OF THE PLATE.

PLATE XCIII. ACER SACCHARINUM.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. A staminate flower, enlarged.
4. A pistillate flower, enlarged.
5. A pistil, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a samara, enlarged.
9. Vertical section of a seed, enlarged.
10. An embryo, enlarged.
11. An embryo displayed, enlarged.
12. A winter branchlet, natural size.



C.E.Faxon del. Picart fr. sc.

ACER SACCHARINUM, L.

A.Riocreux direx.t Imp. R.Taneur, Paris

ACER RUBRUM.

Red Maple. Scarlet Maple.

Flowers pedicellate in axillary fascicles; ovary and young fruit glabrous. **Leaves 3 to 5-lobed.**

Acer rubrum, Linnæus, *Spec.* 1055. — Du Roi, *Diss.* 59. — Marshall, *Arbust. Am.* 3. — Lamarck, *Dict.* ii. 380. — Ehrhart, *Beitr.* iv. 23. — Castiglioni, *Viag. negli Stati Uniti*, ii. 171. — Schmidt, *Oestr. Baum.* i. 10, t. 6. — Abbot, *Insects of Georgia*, ii. 93. — Aiton, *Hort. Kew.* iii. 434 (excl. var.). — Moench, *Meth.* 56. — Michaux, *Fl. Bor.-Am.* ii. 253. — Persoon, *Syn.* i. 417. — Robin, *Voyage*, iii. 471. — *Nouveau Duhamel*, iv. 31. — Willdenow, *Spec.* iv. 984; *Enum.* 1044. — Desfontaines, *Ann. Mus.* vii. 413, t. 25, f. 2; *Hist. Arb.* i. 391. — Poiret, *Lam. Dict.* Suppl. ii. 574; *Ill.* iii. 438, t. 844, f. 3. — Trattinick, *Archiv.* i. t. 9. — Michaux f. *Hist. Arb. Am.* ii. 210, t. 14. — Pursh, *Fl. Am. Sept.* i. 265. — Bigelow, *Fl. Boston.* 247. — Nuttall, *Gen.* i. 252; *Sylva*, ii. 87. — Hayne, *Dendr. Fl.* 213. — Elliott, *Sk.* i. 449. — Torrey, *Fl. N. Y.* i. 137. — Watson, *Dendr. Brit.* ii. t. 169. — Sprengel, *Syst.* ii. 225. — Audubon, *Birds*, t. 54, 67. — Tausch, *Regensb. Fl.* xii., ii. 552. — Hooker, *Fl. Bor.-Am.* i. 114; *Jour. Bot.* i. 199. — Don, *Gen. Syst.* i. 650. — Spach, *Hist. Veg.* iii. 113; *Ann. Sci. Nat.* ser. 2, ii. 176. — Torrey & Gray, *Fl. N. Am.* i. 249, 684. — Dietrich, *Syn.* ii. 1282. — Walpers, *Rep.* i. 409. — Emerson, *Trees Mass.* ed. 2, ii. 551, t. — Darlington, *Fl. Cestr.* ed. 3, 46. — Chapman, *Fl.* 81. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 50. — Buchenau, *Bot. Zeit.* xix. 285, t. 11, f. 15, 16, 28, 29. — Koch, *Dendr.* i. 542. — Bell, *Geolog. Rep. Canada*, 1879–80, 54[c]. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 62. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 50. — Pax, *Engler Bot. Jahrb.* vii. 181. — Watson & Coulter, *Gray's Man.* ed. 6, 118. — Wesmael, *Gen. Acer*, 12.

? **A. glaucum**, Marshall, *Arbust. Am.* 2.

? **A. Carolinianum**, Walter, *Fl. Car.* 251.

A. coccineum, Michaux f. *Hist. Arb. Am.* ii. 203.

A. sanguineum, Spach, *Hist. Veg.* iii. 115; *Ann. Sci. Nat.* ser. 2, ii. 176. — Dietrich, *Syn.* ii. 1282.

A. microphyllum, Pax, *Engler Bot. Jahrb.* vii. 180.

A. semiorbiculatum, Pax, *Engler Bot. Jahrb.* vii. 181.

A. rubrum, var. **semiorbiculatum**, Wesmael, *Gen. Acer*, 13.

A. rubrum, var. **microphyllum**, Wesmael, *Gen. Acer*, 13.

A. rubrum, var. **eurubrum**, var. **sanguineum**, var. **clausum**, var. **pallidiflorum**, var. **tomentosum**, Pax, *Engler Bot. Jahrb.* vii. 181, 182.

A slender tree, eighty to one hundred and twenty feet high, with a tall trunk three to four and a half feet in diameter, and upright branches usually forming a rather narrow head. The bark of the trunk varies from a quarter to half an inch in thickness, and is dark gray divided by longitudinal ridges, the surface separating into large flake-like scales. The shoots when they appear are green or dark red, turning by autumn dark or bright red and lustrous, and are marked by numerous longitudinal white lenticels; in the second year they become gray, faintly tinged with red. The winter-buds are obtuse, an eighth of an inch long, and covered by thick dark red imbricated scales rounded on the back and ciliate on the margins with a short fringe of pale hairs; the outer pair of scales are much smaller than the others; the inner pairs lengthen with the shoot, and at maturity are three quarters of an inch to an inch long, narrowly oblong, rounded at the apex, and bright scarlet. The leaves are three to five-lobed by acute sinuses, with irregularly doubly-serrate or toothed lobes, the middle lobe being often longer than the others, or they are sometimes lanceolate and scarcely lobed; they are truncate, more or less cordate by a broad shallow sinus, rounded or wedge-shaped at the base, pubescent, especially on the lower surface when young, and at maturity light green and glabrous on the upper, and white and more or less pubescent on the lower surface, particularly along the principal veins. They are chartaceous or sometimes almost coriaceous, an inch and a half to six inches in length and rather longer than broad, and are borne on slender red or green petioles two to four inches long.[1] In early autumn they turn to

[1] No other American Maple shows such a tendency to vary in the shape of its leaves. Dr. Ferdinand Pax (*Engler Bot. Jahrb.* vii. 180) distinguishes three species and a number of varieties of the Red Maple, based principally on the shape of the leaves. This

brilliant shades of scarlet or scarlet and orange. The flowers are pedicellate and are produced in few-flowered fascicles developed on the branches of the previous year from aggregated obtuse buds,[1] the staminate and pistillate flowers in separate clusters on the same or on different trees; they open in March and April before the appearance of the leaves, and are bright scarlet or dull yellowish red. The sepals are oblong and obtuse, and as long as and broader than the oblong or linear petals. There are from five to eight scarlet stamens, with slender filaments exserted in the sterile, and included in the fertile flower. The ovary is glabrous, and is borne on a narrow slightly lobed glandular disk; the styles are united for a short distance above the base, and then separate into long exserted stigmatic lobes.[2] The fruit, which ripens in the latter part of spring or in early summer, is borne on drooping stems three or four inches long and is scarlet, dark red, or brown, with thin erect wings convergent at first and divergent at maturity, half an inch to an inch in length, and from a quarter to half an inch in breadth. The seed has a dark red rugose testa, thin foliaceous cotyledons, and a long thin radicle; it germinates immediately after falling to the ground.

Acer rubrum is one of the most common and generally distributed trees of eastern North America. It extends from about latitude 49° north in New Brunswick, Quebec, and Ontario, southward to the Indian and Caloosa rivers in southern Florida, and westward to the Lake of the Woods, eastern Dakota and Nebraska, Indian Territory, and the valley of the Trinity River in Texas. It occurs along the borders of streams or in low wet swamps, which it sometimes covers, particularly at the north, almost to the exclusion of other trees; or in the northern states it is mingled with the Black Ash, the Swamp White Oak, and the Gum-trees, and in the south with the Swamp Bay, the White Oak, the Loblolly Bay, the Red Gum, and the Cotton Gum. It is most common in the south, especially in the valley of the Mississippi River, and attains its largest size in the river-swamps of the lower Ohio and its large tributaries. The Red Maple is one of the most beautiful trees of the American forests, and is a conspicuous feature in the landscape in spring, when its branches, still destitute of leaves, are covered with its brilliant red fruit, or in the early autumn, when it enlivens the lowlands with a blaze of scarlet.[3]

The wood of *Acer rubrum* is very heavy, close-grained, easily worked, and not very strong. It is light brown, often slightly tinged with red, with a smooth satiny surface and many obscure medullary rays. The thick sapwood is rather lighter colored than the heartwood. The specific gravity of the absolutely dry wood is 0.6178, a cubic foot weighing 38.50 pounds. It is now used in large quantities in the manufacture of chairs and other furniture, in turnery, for wooden ware, and for gun-stocks. A variety with beautifully undulating grain is much valued by cabinet-makers. Ink is sometimes made domestically by boiling the bark of the Red Maple in soft water and combining the tannin which it contains in large quantities with sulphate of iron. At one time the bark was occasionally employed in dyeing.[4]

is a character, however, which can hardly be depended on in the case of this tree. Of two individuals standing side by side, one may have large thin five-lobed leaves cordate or truncate at the base, and the other small thick almost entire leaves rounded at the base; or nearly all the forms may be found on different parts of the same tree, or sometimes even on the same branch.

[1] Linnæus, *Amœn. Acad.* ii. 204.

[2] The flowers of the Red Maple are usually described as polygamous, and it is possible that perfect flowers occasionally occur on this tree. Much more commonly they are monœcious or diœcious by the abortion in the pistillate flowers of the stamens, which, although they are apparently well-formed in the bud, do not lengthen after the flower opens, and fall without discharging any pollen. The staminate and pistillate flowers are generally produced on separate trees, although a branch with staminate flowers can sometimes be found on a tree on which the flowers are pistillate. Meehan notices that the sterile flowers of the Red Maple are fragrant, and that the fertile flowers are scentless (*Proc. Phil. Acad.* 1878, 122).

[3] At the north *A. rubrum* is one of the first trees to change the color of its leaves, and the earliest general effects of autumn color are produced by this tree. It is not unusual in dry seasons to find individual trees beginning to assume their autumnal tints by the end of August, while the majority do not turn until late in September or early in October.

[4] The characteristics of the bark appear to have been known to the Indians, as Josselyn, when describing an oil made by them in eastern Massachusetts out of the acorns of the White Oak, says: "The Natives draw an Oyl, taking the rottenest Maple Wood, which being burnt to ashes, they make a strong Lye therewith, wherein they boyl their white Oak-Acorns until the Oyl swim on the top in great quantity" (*New England Rarities*, 48). See, also, Kalm, *Travels*, English ed. i. 168.

Acer rubrum, var. *Drummondii*,[1] a well-marked variety of the Red Maple, is common in the deep river-swamps of southern Arkansas, eastern Texas, and western Louisiana, and occurs occasionally in the other Gulf states and in southern Georgia. The leaves are three-lobed with short broad lobes, usually rounded, or sometimes a little cordate at the base, which is entire or slightly and remotely crenulate-toothed. The lower surface is covered, as are the young shoots and petioles, with thick white tomentum. The fruit, which ripens late in March or in April, is bright scarlet with large convergent wings two or two and a half inches long and a half to three quarters of an inch broad.[2]

The Red Maple, as it inhabited swamps in the immediate neighborhood of the coast, attracted the attention of early travelers in America; it was carried to England as early as 1656, probably by the younger Tradescant,[3] in whose garden near London it was growing in that year. The first description, drawn from Tradescant's cultivated trees, was published by Plukenet[4] in 1691. It has always been a favorite tree in cultivation in the United States and in Europe, and a number of seminal varieties[5] have appeared. None of these are particularly distinct or valuable. The Red Maple, although it is found only in low wet ground which is often submerged during a large part of the year, grows as rapidly and to as large a size when planted in rich well-drained upland soil as it does in its native swamps; and its excellent habit, the beauty of its leaves in summer and in autumn, the brilliancy of its fruit, and its freedom from disease, make it one of the most desirable of the trees of eastern America to plant for ornament where sufficient space can be allowed for its full development.[6]

[1] *Acer rubrum*, var. *Drummondii*, Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 50.

A. Drummondii, Hooker & Arnott, *Jour. Bot.* i. 199. — Nuttall, *Sylva*, ii. 83, t. 70.

[2] This tree in some extreme forms is certainly very distinct, but it seems to pass gradually by many intermediate forms found in the eastern Gulf states into the typical Red Maple. Large trees destitute of leaves and covered in the early spring with intensely scarlet fruit are very beautiful, especially when they are surrounded by the broad-leaved evergreen Bays with which the Red Maple is usually associated in the Gulf states.

[3] See i. 20.

[4] *Acer Virginianum folio majore subtus argenteo, supra viridi splendente, Phyt.* t. 2, f. 4; *Alm. Bot.* 7. — Catesby, *Nat. Hist. Car.* i. 62, t. 62.

Acer Virginianum folio subtus incano flosculis ex viridi rubentibus, Hermann, *Parad. Bat.* i. t. 1. — Miller, *Dict. Icon.* i. 6, t. 8, f. 2.

Acer folio palmato-angulato flore fere apetalo sessili fructu pedunculato corymboso, Clayton, *Fl. Virgin.* 41. — Colden, *Cat.* 85.

Acer foliis quinquelobis subdentatis subtus glaucis, floribus pedunculatis simplicissimis rare aggregatis dioicis, Trew, *Pl. Ehret*, 47, t. 85.

[5] Nicholson, *Gard. Chron.* n. ser. xv. 172.

[6] The Red Maple and other forest trees, especially the Canoe Birch, the Red Oak, and the Mountain Ash, are sometimes destroyed in considerable numbers in northern New England by the Yellow-bellied Woodpecker (*Sphyrapicus varius*, Baird), who drills into the trunk for the purpose of drinking the sweet sap. (Frank Bolles, *Garden and Forest*, iv. 177.)

EXPLANATION OF THE PLATES.

PLATE XCIV. ACER RUBRUM.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, enlarged.
9. Vertical section of a seed, enlarged
10. An embryo, enlarged.
11. An embryo, displayed and enlarged.
12. A winter branchlet, natural size.

PLATE XCV. ACER RUBRUM, var. DRUMMONDII.

1. A branch with staminate flowers, natural size.
2. A branch with pistillate flowers, natural size.
3. A staminate flower, enlarged.
4. A pistillate flower, enlarged.
5. A sterile branch, natural size.
6. A fruiting branch, natural size.
7. Vertical section of a seed, enlarged.
8. An embryo, enlarged.

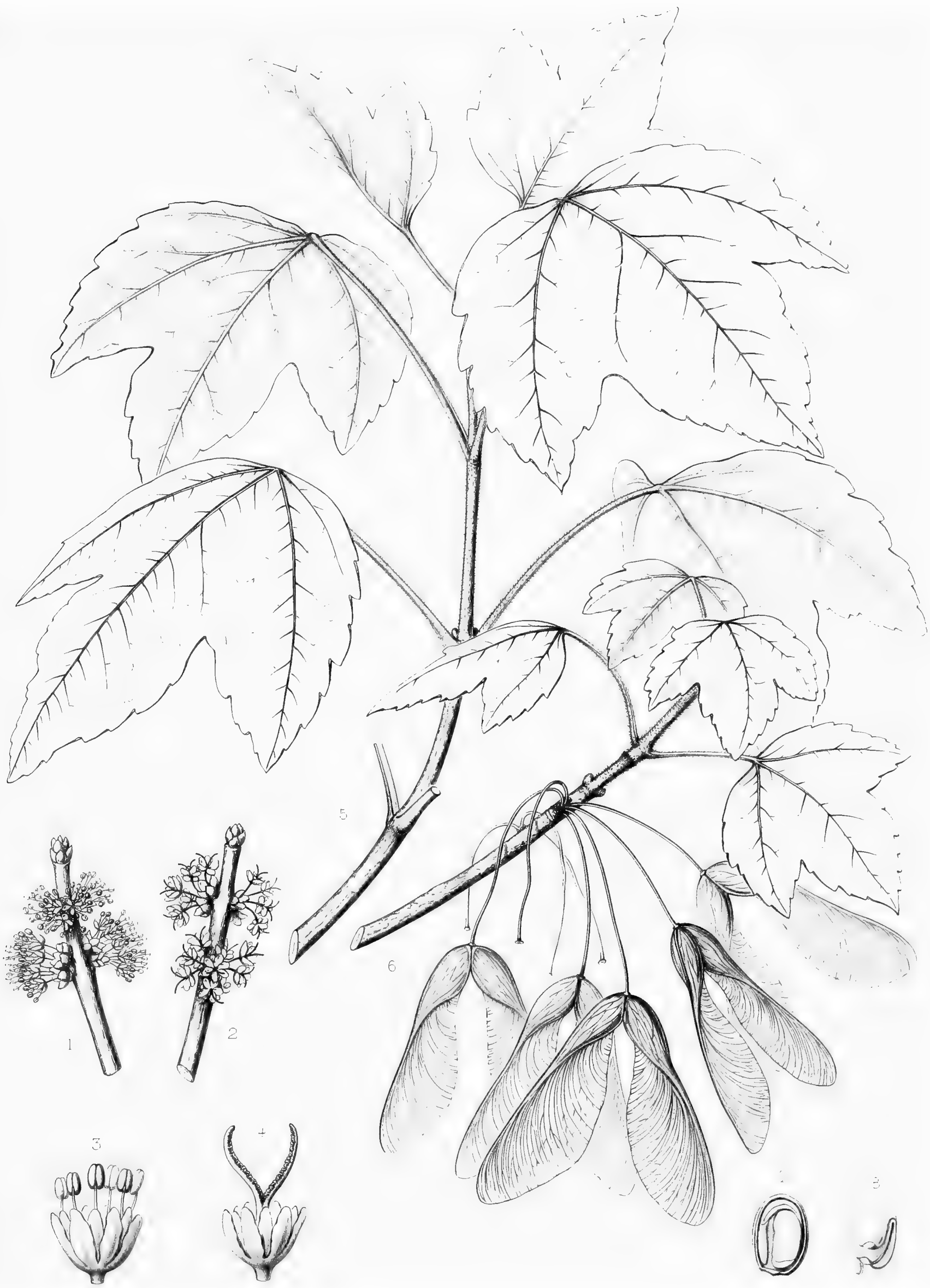
C.E. Faxon del.

Picart fr sc.

ACER RUBRUM. L

A. Riocreux direct.t

Imp. R. Taneur, Paris.



C.E. Faxon del. Picart fr sc.

ACER RUBRUM, Var DRUMMONDII, Sarg.

A. Riocreux direx t. Imp. R. Taneur, Paris.

ACER NEGUNDO.

Box Elder. Ash Leaved Maple.

FLOWERS diœcious, destitute of petals. Leaves pinnately or ternately divided.

Acer Negundo, Linnæus, *Spec.* 1056. — Wangenheim, *Nordam. Holz.* 30, t. 12, f. 29. — Marshall, *Arbust. Am.* 2. — Castiglioni, *Viag. negli Stati Uniti*, ii. 172. — Lamarck, *Dict.* ii. 380. — Schmidt, *Oestr. Baum.* i. 14, t. 12. — Walter, *Fl. Car.* 250. — Aiton, *Hort. Kew.* iii. 436. — Michaux, *Fl. Bor.-Am.* ii. 253. — Persoon, *Syn.* i. 418. — Desfontaines, *Hist. Arb.* i. 391. — Willdenow, *Spec.* iv. 992; *Enum.* 1046. — *Nouveau Duhamel*, iv. 27, t. 7. — Trattinick, *Archiv.* i. t. 40. — Michaux f. *Hist. Arb. Am.* ii. 247, t. 18. — Pursh, *Fl. Am. Sept.* i. 268. — Hayne, *Dendr. Fl.* 216. — Elliott, *Sk.* i. 452. — James, *Long's Exped.* ii. 69. — Torrey, *Ann. Lyc. N. Y.* ii. 172; *Emory's Rep.* 407. — Sprengel, *Syst.* ii. 225. — Guimpel, Otto & Hayne, *Abbild. Holz.* 119, t. 95. — Dietrich, *Syn.* ii. 1283. — Buchenau, *Bot. Zeit.* xix. 285, t. 11, f. 31, 32. — Koch, *Dendr.* i. 544. — Baillon, *Hist. Pl.* v. 374, f. 426. — Pax, *Engler Bot. Jahrb.* vii. 211.

Negundo aceroides, Moench, *Meth.* 334. — Torrey & Gray, *Fl. N. Am.* i. 250. — Nuttall, *Sylva*, ii. 91. — Gray, *Gen. Ill.* ii. 202, t. 175; *Jour. Bost. Soc. Nat. Hist.* vi. 166 (*Pl. Lindheim.* ii.); *Pl. Fendler.* 29 (*Mem. Am. Acad.* n. ser. iv.); *Pl. Thurber.* 300 (*Mem. Am. Acad.* n. ser. v.). — Darlington, *Fl. Cestr.* ed. 3, 46. — Chapman, *Fl.* 81. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 53. — Watson, *King's Rep.* v. 52; *Pl. Wheeler*, 7; *Proc. Am. Acad.* xvii. 338. — Rothrock, *Wheeler's Rep.* vi. 84. — Bell, *Geolog. Rep. Canada*, 1879–80, 48c. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 50. — Coulter, *Rocky Mt. Bot.* 49. — Watson & Coulter, *Gray's Man.* ed. 6, 118.

Negundium fraxinifolium, Rafinesque, *N. Y. Med. Rep.* hex. 2, v. 352, 354; Desvaux, *Jour. Bot.* ii. 170.

Negundo fraxinifolium, Nuttall, *Gen.* i. 253. — De Candolle, *Prodr.* i. 596. — Hooker, *Fl. Bor.-Am.* i. 114. — Don, *Gen. Syst.* i. 651. — Spach, *Hist. Veg.* iii. 119. — Rafinesque, *New Fl.* i. 48. — Scheele, *Roemer Texas*, 433. — Schnizlein, *Icon.* t. 227, f. 2, 18.

? Negundo Mexicanum, De Candolle, *Prodr.* i. 596. — Schlechtendal, *Linnæa*, xvi. 487. — Hemsley, *Bot. Biol. Am. Cent.* i. 214. — Pax, *Engler Bot. Jahrb.* vii. 212.

Negundo trifoliatum, Rafinesque, *New Fl.* i. 48.

Negundo lobatum, Rafinesque, *New Fl.* i. 48.

Negundo Californicum, Scheele, *Roemer Texas*, 433 (not Torrey & Gray).

A. Negundo, var. **Texanum**, Pax, *Engler Bot. Jahrb.* vii. 212.

Negundo Negundo, Sudworth, *Garden and Forest*, iv. 166.

A tree, fifty to seventy feet in height, with a trunk two to four feet in diameter, dividing near the ground into a number of stout wide-spreading branches. The bark of the trunk is from a quarter to half an inch thick, pale gray or light brown, and deeply cleft into broad rounded ridges, the surface separating into short thick scales. The branchlets when they first appear are pale green and glabrous or slightly pubescent; in their first winter they are marked with a few dark lenticels, and are bright green and lustrous or sometimes pale purple with a glaucous bloom;[1] in the second and third years they are gradually covered with smooth or somewhat fissured bark and are still marked with lenticels. The terminal winter-bud is acute, an eighth of an inch long, and rather longer than the obtuse lateral buds; they are protected by scales with slightly overlapping edges and thickly coated with pale tomentum, the outer pair being often rudimentary, while the inner pairs are accrescent with the shoot, an inch long at maturity and deciduous, leaving when they fall conspicuous scars visible at the base of the branchlets for two or three years. The leaves are three or five-foliolate, and are borne on slender petioles two or three inches in length, with enlarged bases often furnished with a minute fringe of stipule-like deciduous white hairs, and in falling leave large conspicuous scars surrounding the stem; the leaflets are ovate

[1] This purple color of the bark of the young branchlets seems more common on the trees in the region between the Great Lakes and the eastern base of the Rocky Mountains than on those in other parts of the country. Seed gathered in this region produce trees which grow in cultivation more rapidly and to a larger size and which are hardier than those raised from seed gathered in the east. This midcontinental form of the Negundo is found in German nurseries under the name of *Negundo Californicum*, but it must not be confounded with the Pacific-coast tree.

or oval, acute, rounded, or wedge-shaped at the base, and coarsely and irregularly serrate above the middle, or sometimes three-lobed, the lower surface being coated with tomentum when they unfold, and at maturity are smooth or more or less pubescent; they are membranaceous, prominently veined, light bright green, paler on the under than on the upper surface, two to four inches long and two or three inches broad, and are borne on stout petiolules, that of the terminal leaflet being often an inch long, or twice the length of those of the rather smaller lateral leaflets. The sterile and fertile flowers appear on separate trees, and expand just before or with the leaves from buds developed in the axils of the last leaves of the previous year, the sterile flowers fascicled on slender hairy pedicels an inch and a half to two inches in length, the fertile flowers in narrow drooping racemes. The flowers are minute, apetalous, and yellow-green, with a hairy calyx which is five-lobed and campanulate in the sterile flower, and in the fertile flower is much smaller and divided to the base into five narrow sepals. There are four to six stamens in the sterile flower, with slender exserted hairy filaments and long linear anthers surmounted by the pointed end of the connective. The ovary, which is placed on a narrow rudimentary disk, is covered with pubescence, and is only partly inclosed by the calyx; the styles separate at the base into two long stigmatic lobes. The fruit, which attains its full size early in the summer, hangs on stems an inch or two inches long, in graceful racemes six or eight inches in length; it ripens in the autumn and drops from the stems which remain upon the branches until the following spring; the samaras are an inch and a half to nearly two inches long, with narrow acute nutlets diverging at an acute angle, and with thin reticulate-veined straight or falcate wings, the margin undulate towards the apex. The seed is narrowed at each end, and is half an inch in length, with a thin coat, narrow thin cotyledons, and a rather long radicle.

Acer Negundo is one of the most widely distributed, and in some parts of the country one of the commonest, trees of the North American forest. It occurs on the banks of the Winooski River and of Lake Champlain in Vermont, on the shores of Cayuga Lake in New York, in eastern Pennsylvania, and ranges to Hernando County, Florida, and northwestward to Dog's Head Lake in Winnipeg and along the southern branch of the Saskatchewan to the eastern base of the Rocky Mountains; in the United States it is found as far west as the eastern slopes of the Rocky Mountains in Montana, the Wahsatch Mountains in Utah, western Texas, New Mexico, and eastern Arizona, extending south along the mountain ranges of northeastern Mexico. The Box Elder inhabits the banks of streams and lakes and the borders of swamps; it is comparatively rare in all the region east of the Appalachian Mountains, and is much more common in the basin of the Mississippi, being most abundant and reaching its greatest size in the valleys of the streams which flow into the lower Ohio River. Here it flourishes in the deep rich moist and often inundated bottom-lands, forming a large part of the growth under the Oaks, Hickories, and Gum-trees, which in such situations rise to a great height. It is mingled with Willows, the Elm, and the Hackberry on the banks of the streams which flow through the midcontinental plateau almost to the western limit of tree-growth, while in the central mountain region it is confined to valleys five or six thousand feet above the level of the sea.

In western Texas and in New Mexico the pubescence which clothes the young shoots and the under surface of the leaves of the Box Elder increases in thickness and is persistent, and the eastern tree is thus gradually connected with the variety[1] which in California is found on the banks of streams in the valley of the lower Sacramento River, and in the interior valleys of the coast ranges from the Bay of

[1] *Acer Negundo*, var. *Californicum*, Sargent, *Garden and Forest*, iv. 148.

Negundo Californicum, Torrey & Gray, *Fl. N. Am.* i. 250, 684. — Hooker & Arnott, *Bot. Voy. Beechey*, 327, t. 77. — Walpers, *Rep.* i. 410. — Bentham, *Pl. Hartweg.* 301. — Nuttall, *Sylva*, ii. 90, t. 72. — Koch, *Dendr.* i. 515. — Brewer & Watson, *Bot. Cal.* i. 108.

Acer Californicum, Dietrich, *Syn.* ii. 1283. — Pax, *Engler Bot. Jahrb.* vii. 213. — Wesmael, *Gen. Acer*, 27. — Greene, *Fl. Francis.* i. 76.

Negundo aceroides, Torrey, *Pacific R. R. Rep.* iv. 74; *Bot. Mex. Bound. Surv.* 47; *Bot. Wilkes Explor. Exped.* 259 (not Moench). — Bolander, *Proc. Cal. Acad.* iii. 78.

Negundo aceroides, var. *Californicum*, Sargent, *Garden and Forest*, ii. 364.

San Francisco to about latitude 35°, and in high cañons on the western slopes of the San Bernardino Mountains. The California Negundo, which is a spreading tree fifty or sixty feet in height, may be distinguished by the bark which is darker than that of the eastern tree, by the thick tomentum of the winter-buds, by the short pale persistent pubescence of the branchlets and ripe fruit, and by the constantly trifoliate leaves with larger more coarsely serrate and more frequently lobed leaflets densely coated, even at maturity, on the lower surface with pale pubescence.

The wood of *Acer Negundo* is light, soft, close-grained, but not very strong; it is creamy white, with thick, hardly distinguishable sapwood, and contains numerous medullary rays. The specific gravity of the absolutely dry wood is 0.4328, a cubic foot weighing 26.97 pounds. The specific gravity of the wood of a tree grown in Contra Costa County, California, is 0.4821, a cubic foot weighing 30.04 pounds. The wood of the Box Elder is occasionally manufactured into cheap furniture, and is sometimes used for the interior finish of houses, for wooden ware, cooperage, and paper pulp. Small quantities of maple-sugar are occasionally made from this tree.[1]

Acer Negundo was one of the first North American trees known in Europe; Ray first described it in the *Historia Plantarum*,[2] published in 1688,[3] from plants cultivated by Bishop Compton[4] in his garden at Fulham near London. It was discovered in California in the neighborhood of Monterey by David Douglas.

The rapid growth made by the Box Elder in good soil, its hardiness, and the cheerful color of its graceful foliage have always made it a favorite tree in gardens, although it is not long-lived or very stately or handsome in old age; and in the United States it has been planted in great numbers of late years, especially in the naturally treeless central part of the continent, where it supports better than many other trees the severe climatic changes and the deficiency of moisture. Many varieties[5] have appeared in nurseries, and one of them, producing leaves marked with broad blotches of pure white, is now a popular garden-plant in most European countries.

[1] Professor J. B. Harrington (*Trans. Roy. Soc. Canada*, v. 3, 1887) found that the average yield of sugar for a number of trees was 2.50 per cent.

[2] *Arbor exotica foliis Fraxini instar pinnatis, et serratis, Negundo perperam credita*, ii. 1798.

Acer maximum foliis trifidis et quinquifidis, Virginianum, Plukenet, *Phyt.* t. 123, f. 4, 5; *Alm. Bot.* 7. — Boerhaave, *Hort. Lugd. Bat.* ii. 234. — Duhamel, *Traité des Arbres*, i. 28.

Acer foliis compositis, Linnæus, *Hort. Cliff.* 144. — Royen, *Fl. Leyd. Prodr.* 460. — Clayton, *Fl. Virgin.* 154. The word *Negundo*, which appears to have been first used by Ray, is of unknown meaning and derivation.

[3] Aiton, *Hort. Kew.* iii. 436. — Loudon, *Arb. Brit.* i. 460, t.

[4] See i. 6.

[5] Pax (*Engler Bot. Jahrb.* vii. 211) distinguishes the varieties cultivated in European nurseries as

Var. *vulgare* (*A. Californicum, A. versicolor, A. violaceum*, Hort.).

a. *bicolor* (*A. aureo-variegatum*, and *A. argenteo-variegatum*, Hort.).

b. *angustissimum* (*A. crispum*, Hort.).

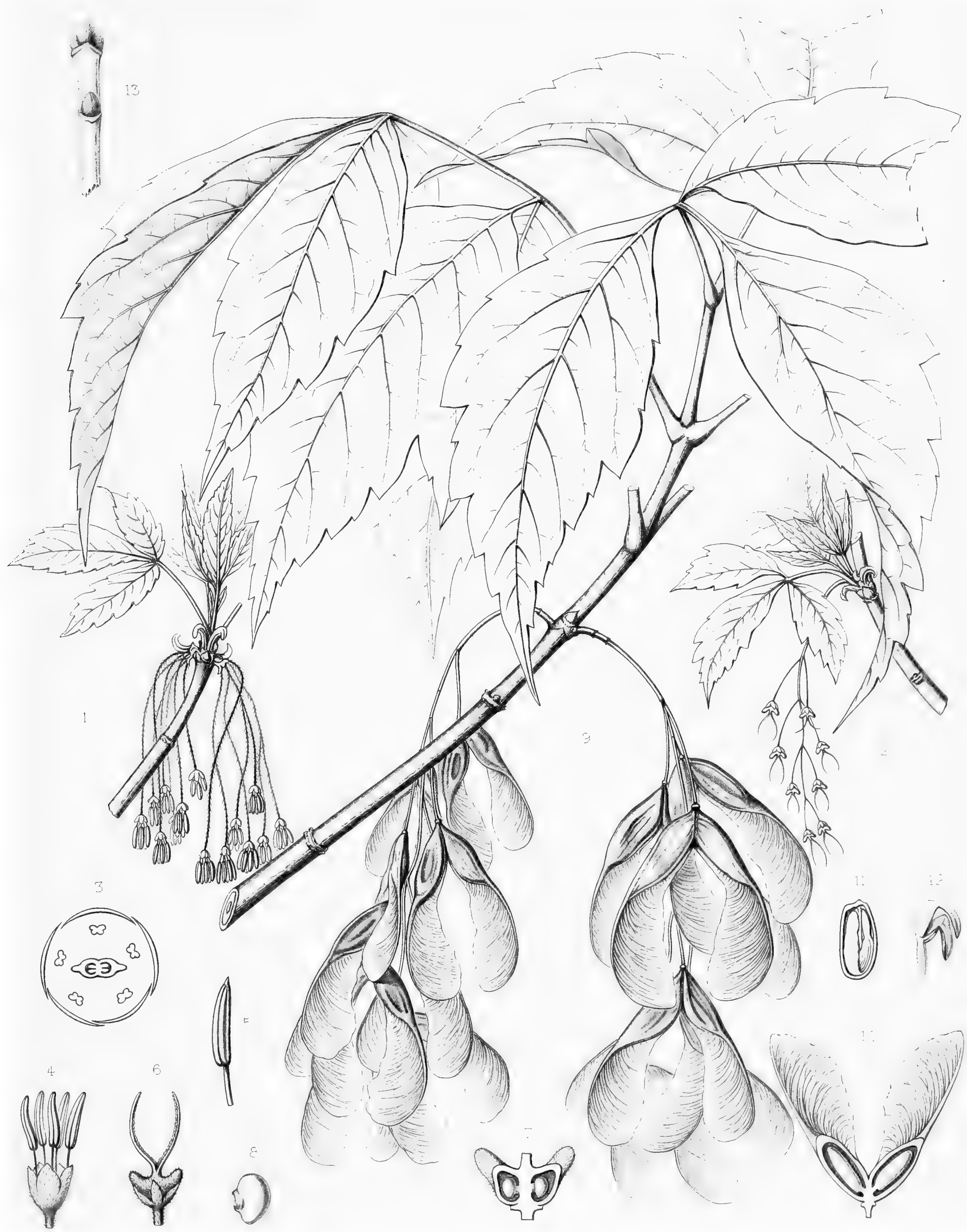
EXPLANATION OF THE PLATES.

Plate XCVI. Acer Negundo.

1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. A stamen, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Vertical section of a fruit, enlarged.
11. Vertical section of a seed, enlarged.
12. An embryo, enlarged.
13. A winter branchlet, natural size.

Plate XCVII. Acer Negundo, var. Californicum.

1. A flowering branch of the pistillate tree, natural size.
2. A flowering branch of the staminate tree, natural size.
3. A pistillate flower, enlarged.
4. A staminate flower, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a fruit, natural size.
7. Vertical section of a seed, enlarged.
8. An embryo, enlarged.
9. A winter branchlet, natural size.



C.E. Faxon del

Picart fr sc.

ACER NEGUNDO, L.

A. Riocreux dirext

Imp. R. Taneur. Paris

C E Faxon del. Picart fr. sc

ACER NEGUNDO, Var CALIFORNICUM, Sarg.

A. Riocreux direx.t Imp R. Taneur, Paris.

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